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Chairman and Joint Managing Director: G. H. ALABASTER COMPANION I.E.E.

Technical Editor: C. O. BRETTELLE, M.I.E.E.

Joint Managing Director: E. A. GATEHOUSE M.I.E.E., A.M.INST.C.E.

Commercial Editor: A. H. BRIDGE

Manager and Secretary: E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

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World Developments.

AFTER trade has been depressed for a long time, observers of the world economic situation scan the horizon with anxious hope watching for the first signs of awakening, however small and however far-off they may be.

We have indulged in this practice in past days and remember well the buoyancy of spirit with which we have collected and recorded in the pages of the ELECTRICAL REVIEW the various signs of returning confidence. They turned up in all sorts of places and sometimes in quite unlooked-for ways—a three-line cable dispatch in a financial newspaper, a sentence or two in a City Man's speech, a word or two in letters from overseas, a small movement on 'Change, a trade caller's optimism backed by real orders and increasing inquiries—and then came the very clear proofs that revival had actually begun.

To-day, when anxiety is greater because the depression curve has been so protracted, so deep, and due to the joint influence of so many exceptional causes, more thinkers than ever are alert looking for the signs. To the experienced observer the signs of the approach of better times generally are at present very faint; such as they are, they should be welcomed, but there is little need to say much about them lest they prove illusory and are upset by some unexpected development somewhere or other in this restless world. We may, however, at least, hope that they will grow substantially until many lands resume the great work of the development of their own vast resources.

From Canada, concerning which electrical market we have given a good deal of information of late, comes more encouraging news than from any other part of the British Empire. There, according to information received from the Royal Bank of Canada (Montreal) regarding the projected power developments now under way, the Water Power Branch of the Department of the Interior estimates that £20,000,000 will be spent in each of the next three years upon hydro-electric expansion. These are colossal figures to minds that are gravely concerned at our unemployment returns and are eager for legitimate and profitable work-producing

developments to be proceeded with. Consequently, such operations must possess a special interest for British manufacturers of electrical equipment, and we hope that stronger efforts than ever will be made to secure a good share of the resultant orders for the Mother Country. But expansion on such a scale is also regarded as objective evidence of a substantial belief in the continued progress and prosperity of Canadian industries, and still further as having a far-reaching influence upon the business world in general. The constant extension of power plant anywhere contemplates, of course, expenditure of all kinds additional to its own cost for all classes of industries, engineering and general construction, including important building contracts.

We are told that we are justified in regarding such a movement as heralding the return of prosperity, although the latest dispatches indicate a more restricted immigration. Of course, there has been hydro-electric development work proceeding continuously there for many years past, but the figures given for the next three years remind one of Canada's vast undeveloped resources and of the wonderful future that the Dominion has in store—often predicted as being greater than even the past prosperity of the United States. If the present evidences from Canada could be followed up with like reports from other parts of the British Empire, we should judge the signs of economic revival on the horizon as being far more definite. But even then we should only expect these developments to have a slight immediate effect on unemployment returns of such magnitude; the indirect benefit and the promise of relief in a few years would only provide immediate hope, not realisation.

Blue Books and other reports that have been issued in the past regarding the enormous potential resources of the Empire have been overwhelming in their predictions of what must come at some time or other, and the Economic Conference that is to meet shortly will, we trust, be thinking very deeply indeed regarding the hastening of utilisation projects as one of the ways in which a consolidated British people can bring work for our own factories simultaneously with the local advantages that the development of the at present untouched resources will bring to the Colonies themselves. Finance is naturally a big factor. For instance, during the Canadian constructional operations, as the Royal Bank of Canada document states, large amounts of capital must be raised, and how and when it is called for must be decided by the rate and character of the development work that accompanies the hydro-electric work or appears certain to follow it within a reasonable period. If the finance problem is one requiring extreme care in Canada, it must needs be a critical one in the case of other parts of the Empire. The latest developments in the Australian financial position and the reduction of loan allocations for development works are most discouraging. Canada, however, is courageously committed to £60,000,000 outlay in the three years 1930-1933, in spite of the fact that the prevailing depression in business has resulted in a fall in the rate of increase in energy generated there for the first five months of this year, it being only 4 per cent. better than for the corresponding months of 1929, whereas during the past five years the average rate of increase has varied between 10 and 20 per cent.!

One of the greatest influences that has Americanised Canadian development in the past has been the enormous inflow of American capital. The British Empire will need vast sums of capital to develop its resources and build up its industries whether there is to be a "rationalisation" (blessed word!) inter-working or co-operation between Home and Overseas manufacturers or not, but where are the opportunities now for the British people to save large sums for such investment purposes like they used to do in less Socialistic tax-burdensome days? Still, we may take encouragement from the Canadian plans, hope that a share of the orders will come our way, and look to the Economic Conference to suggest a solution of the finance problem.

As a journal representative of an important industry which ought to contribute a large share of its future activities to big overseas engineering and allied development work, we hold that the British Empire offers vast opportunities for work if its territories and resources are to be freely developed and are not to stagnate. But we cannot afford to overlook the coming needs of South America, the Far East, and some European markets. The hope of an industrial nation such as ours lies in the Development of the Resources of the World.

The Norwich Rural Area.

ALTHOUGH full particulars have not yet been issued by the Electricity Commissioners, it may be taken that the scheme for electrifying 49 parishes covering 125 square miles of rural area around Norwich will follow generally the precedent laid down for the Bedford scheme, an account of which was given in our issue of February 28th, 1930. The experience obtained from the new test will form a useful supplement to the other, as, although mixed farming provides the staple industry in both localities, there are other relevant factors which prevent the conditions being identical. Norfolk would appear to offer a less favourable field for commercial results. The population in the selected area is only 113 per square mile as against 157 in the Bedfordshire area. Moreover, it does not start with the initial advantage of a number of large residences which, in the case of Bedford, should form a nucleus load. It is understood that the capital cost of the Norfolk scheme will be of the order of £60,000 and that money may be advanced by the Unemployment Grants Committee.

From reports appearing in the daily Press it might be inferred that the Central Electricity Board was about to undertake the detail distribution of electricity. The Board, of course, has no power to take upon itself this duty, and the leading particulars are as reported in our last issue.

Mr. F. M. LONG, city electrical engineer of Norwich, who is among the pioneers in rural electrification as well as in domestic electrification, will be responsible for the carrying out of the scheme. As we reminded our readers in our issue of August 15th (p. 252) Mr. Long was the originator of the rateable value system, sometimes called the "Norwich system," of charging for electricity used for domestic purposes.

The Situation in Italy.

JUDGING by a recent Department of Overseas Trade report, which is reviewed in this issue, 1929 was a year of comparative tranquillity in Italian economic affairs. The institution of fairly close Government control of finance and industry appears to have produced stability, if only of a temporary character. The Italian electrical industry seems to be in a prosperous condition, but it is noteworthy that, while production tended to exceed the demand, imports of electrical equipment into Italy were maintained at about the level of previous years. In 1929 there was a considerable rise in telephone and telegraph apparatus imports, of which Germany was the leading supplier. This increase is no doubt accounted for by the reorganisation of the trunk telephone service on a large scale, involving an expenditure of about 520 million lire (£5,600,000).

Hydro-electric development continues to go ahead; the extent of this development is evident from the fact that of the 9,096 million kWh produced in 1929 by 221 recorded undertakings, over 96 per cent. was hydro-electric energy.

The principal competition in the electrical import trade comes from Germany, but this matter is not specifically dealt with in the report. It is worthy of mention, however, that a considerable proportion of the agricultural machinery comes from France and Germany, in which countries American combines are now manufacturing on a large scale.

Artificial-silk Manufacture.

A description of the electrical equipment at the new artificial-silk factory at Lowestoft of Alliance Artificial Silk, Ltd., outlining the modern applications of electricity in that industry.

As a result of our efforts to portray for our readers as opportunity occurs the modern applications of electricity in various industries, we are now able to give a fairly comprehensive account of the electrical installation at the new artificial-silk works at Lowestoft of Alliance Artificial Silk, Ltd., with a brief outline of the process, so as to depict the methods of electricity usage, roughly in the artificial-silk industry, and especially in the process of manufacture adopted in this particular works.

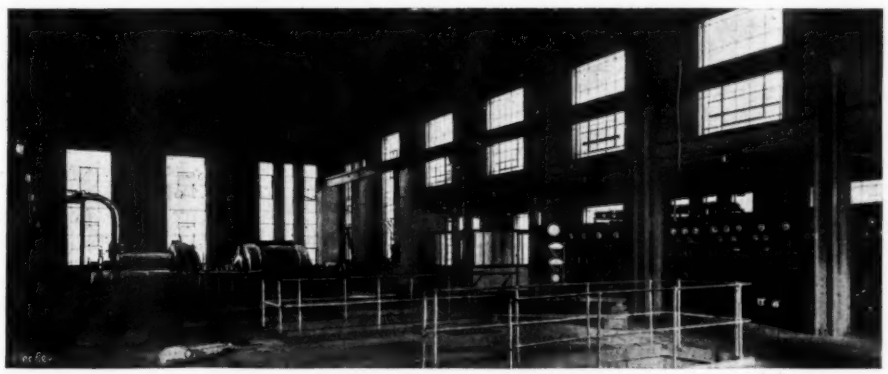


Fig. 1.—Turbine Room at Alliance Silk Factory.

The Alliance company is working under patents and processes acquired from Syntheta A.-G. in Basel, Switzerland, which have been worked out to a large extent by Dr. S. Wild, who is the inventor of important improvements in the machines. The same methods are used as in a French factory producing acetate silk. The plant at Lowestoft is designed for a daily output of from 5 to 7 tons of finished acetate silk, according to the size of the yarn spun. Briefly, the process involves the dissolving of cellulose acetate in various solvents, and evaporating the solvents immediately after the solution has been pressed through very fine jets, resulting in filaments which, after various winding, twisting, and reeling processes, are the finished product.

The cellulose acetate, a white powder, is mixed with the solvents in enclosed and practically automatic apparatus, and the resultant solution has the appearance of artificial honey.

The solution is pumped to the top of spinning frames and is pressed through the jets in heated chambers. The number of holes in a jet ranges from 20 to 420, according to the number of filaments required for the thread. In normal production the filaments weigh only 1 or 2 grammes per 10,000 yards.

The thread is wound into bobbins at the rate of 1,000 feet per minute on automatic spinning machines, the silk being untouched by hand throughout the whole of the process. The spun silk has to be twisted, and from the specially constructed twisting frames it is taken to different departments to be reeled into hanks, transformed into crêpe, or wound on to bobbins or weft pirns, according to the requirements of the market. In addition to its wider field of use in connection with clothing, the product is claimed to have excellent electrical and mechanical properties which render it particularly suitable for use as an insulating medium and protective covering for electric wires.

It will be seen from the above notes that a good deal of heat is required for "process," and with this exception the factory is all-electric. It is self-contained in that its electricity is obtained from its own power station on the site, turbine exhaust serving for the "process" heat. The total capacity of motors at present installed throughout the factory is over 4,000 h.p., which will ultimately be increased to 7,550 h.p. About three miles of p.i., l.c., w.a. cable, and 860 yards of cambric cable are employed throughout the job. Messrs. Mann, Egerton & Co., Ltd., were awarded the contract for the electrical installation.

The power house, fig. 1, is at present equipped with a 2,750-kW turbo-alternator, and a second set of the same capacity is to be almost immediately installed. The set comprises a Belliss & Morcom turbine directly coupled to a 420-V, 3,000-r.p.m., 3-phase, 50-cycle, star-wound alternator by the Lancashire Dynamo and Motor Co., Ltd. The turbine auxiliaries, circulating pumps, &c., amount to a total capacity of 331 h.p., all the motors being controlled by "Ellison" unit-type apparatus. An outstanding feature of the power-house installation is the heavy cabling necessary to carry the low-voltage current from the alternator to the main

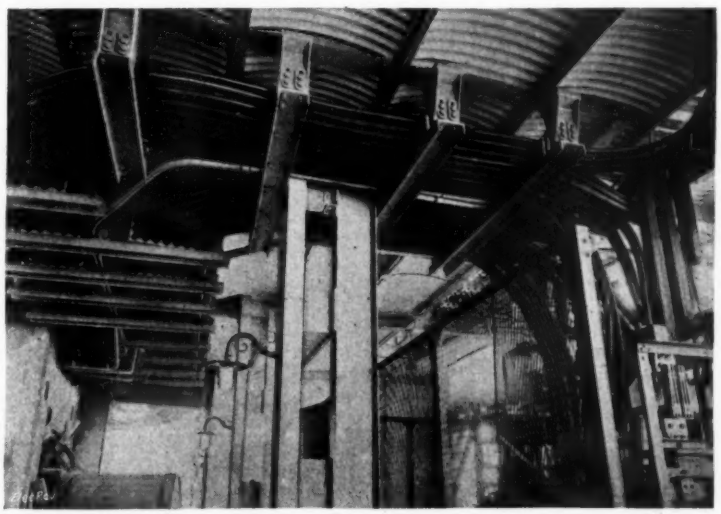


Fig. 2.—Heavy Cable Work, showing Special Clamping.

switch, six 1.25-sq. in. cambric cables per phase and six neutral, the total length being 860 yards. These cables weigh about 7 tons, and they presented a difficult problem to the erectors, which was overcome by the special clamping arrangements depicted in fig. 2, the cables being run in "Henley" porcelain cable racks. The main girder - clamping arrangements are designed to stand a 40-ton jump.

The 5,000 - A main switchgear, fig. 4, which was supplied by Messrs. Crompton Parkinson, Ltd., presents a number of interesting features, including the substantial connecting - bar work, six 3-in. by 5/16-in. bars per phase, special raising and lowering devices for the tanks, adjustable contact tips with V-type beds, heavy synchronising shoes, and gear-operated isolating switches. The main control and distribution switchboard comprises two alternator panels, nine 600- to 1,000-A power distribution panels, and eight 200-A lighting panels. The board, which is 46 ft. long, is erected on the main house girder construction, and the outgoing copper cable tails to the p.i., l.c. cable

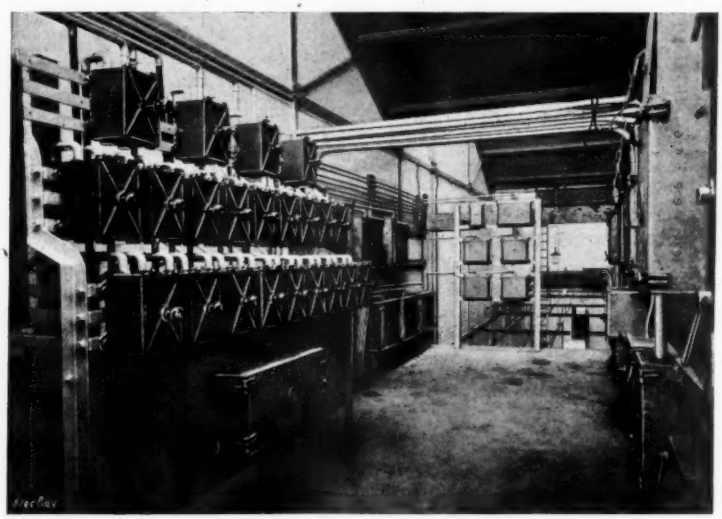


Fig. 3.—Control Room for Explosive End of Factory.

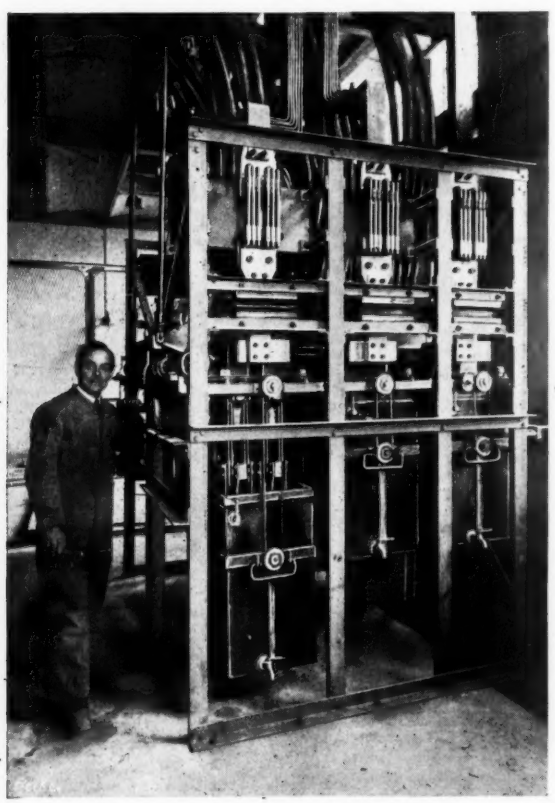


Fig. 4.—5,000-A Oil Circuit Breaker.

trifurcating boxes erected immediately below the switchboard are carried direct to the switches, adequately supported and fixed in "Henley" porcelain racks. A very neat symmetrical arrangement is made of the cable work at the back of the board, where the whole of the copper work, including multiple-bar work and the connections to the earthing resistance and earth plates, is a very neat and efficient lay-out. Each earth plate is 4 ft. 6 in. square by 3/16 in. copper, and is placed at a depth of 8 ft. 6 in. below the ground level.

Steam is supplied from four 25,000-lb. Stirling boilers, 325 lb./sq. in., 750 deg. F., equipped with chain - grate stokers. The whole of the boiler-house auxiliaries are electrically driven and controlled from two centrally placed "Fluvent" distribution boards.

A feature of the boiler-house plant is a high-pressure high - lift boiler-feed-pump set supplied by Messrs. Mather & Platt. Ltd. This consists of a four-stage "Plurovane" pump directly coupled to a 90-h.p., s.c. motor, 3,000 r.p.m., controlled by an "Ellison" star-delta starter. The motor has a specially wound rotor to permit of starting against full head at boiler pressure, and to enable the power station to be got under way quickly it is directly connected across the alternator terminals. It is interesting to note that a cost figure of 0.25d. per kWh has been guaranteed for the generating plant, and that this performance is largely attributed to the special construction of the chimney.

There are some interesting features about the coal-handling plant, which employs a 35-h.p. electric crane and a hopper-conveyor along some 70 yards of the wharf side (Lowestoft Harbour) adjacent to the power house. The crane and hopper are served by a number of "Dorman & Smith" watertight and interlocked plug points, spaced along the quayside. A number of

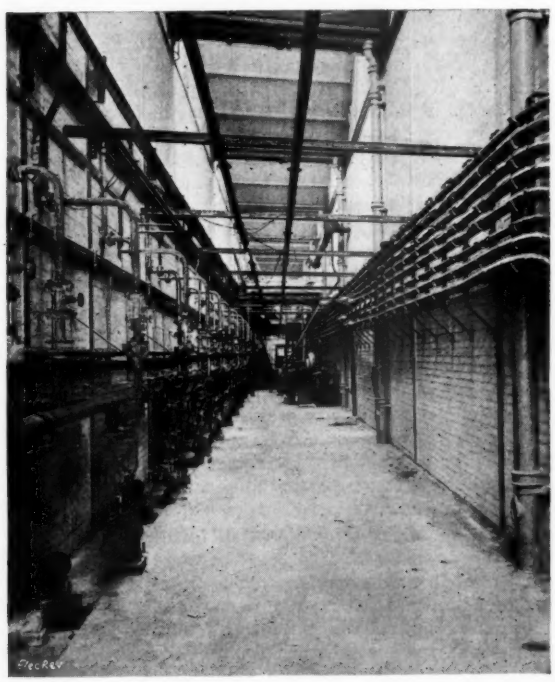


Fig. 5.—The "Dope" Corridor; Note Cable Runs.

" Wembley " lanterns with 500- and 300-W lamps serve for the outside lighting, and are controlled directly from the turbine house.

Ultimately the silk works will embrace four factories, three of which have already been built, but the actual production of the silk is confined, at present at any rate, to one large factory covering a floor area of 850,000 sq. ft. For the purposes of description, this may be said to be divided into four main sections: mixing, spinning, twisting, and reeling.

In the mixing section there are six vertical-type mixing machines, each driven by a 35-h.p. motor through worm gear and under push-button control, in addition to filtering plant, settling tanks, and grinding machines for the raw material. A considerable part of this plant is partially in the open, owing to the prevalence of explosive-laden atmosphere. An important part of the equipment is that used for acetone recovery, and in this connection a 150-h.p. motor-driven compressor is employed. Two gas scrubbers employ 15-h.p. motors, and a feature is spot lights arranged in return headers of the scrubbers for inspection purposes. From this part of the factory the " dope " is pumped by 24 one-h.p. geared reciprocating pumps to the " dope " corridor which, from the electrical viewpoint, is probably the most interesting part of the works. In this corridor, fig. 5, there is also a long line of 49 " dope " pumps, ½ h.p. each, which pump the acetate mixture to cabinets in the spinning rooms, but the corridor also serves as a convenient cable gallery, and it houses some particularly fine samples of cable work, and very long conduit runs neatly arranged within a maze of pipe work. Further, it embraces a central control room for the explosive end of the factory, for which great credit is due to Messrs. Mann, Egerton, as it is believed to represent the first attempt to centralise the electrical control of the " explosive " part of a silk factory. The entire switching and fusing is arranged in this room. The main- and sub-distribution switchboards are mounted all round the room on steel racks. Berry-Skinner push-type ironclad switches are employed, and " Fluvent "-type fuseboards. The main control board consists of eight 120-A ways, and there are 22 lighting and 18 power boards. Fig. 3 is a view in the explosive-end control room, showing the lighting control equipment. The whole of the apparatus is metal enclosed in one continuous system, which is mechanically ventilated by two 35-h.p. motor-driven fans.

(To be concluded.)

Electricity for the Home.

Outlining the progress made in domestic electricity supply within the area served by the State Electricity Commission of Victoria (Australia).*

By "ANTIPODES."

I HAVE been interested in the notes which have appeared in the Electrical Review from time to time regarding the movement initiated in the Old Land for encouraging the more general use of electricity in the home, and I think that what has been done in Victoria in this connection may, in turn, not prove uninteresting to your readers. A recent visit to England somewhat disturbed me, because I found very little knowledge of Australia and its conditions, and of the characteristics of its inhabitants. Might I just say in passing that Victoria, although the smallest state in the Commonwealth, is yet larger than the United Kingdom and Ireland combined. It might be likened to another England, the outlook of the people and their general characteristics being very much the same. It is in supplying " Electricity for the Home " that Victoria occupies such a pre-eminent place amongst the various states of the Australian Commonwealth. Victoria is so far advanced in this connection that it hopes, in a few years' time, to be able to claim to be an all-electric state, containing all-electric towns made up of all-electric homes.

Through the instrumentality of the State Electricity Commission of Victoria, some 1,500 miles of high-pressure transmission lines radiate in all directions throughout the State, touching the border of New South Wales in one instance, and extending practically from shore to shore in other directions. The Commission is exploiting to the full the natural resources of the State, and having built up a comprehensive transmission system and made electricity available on most favourable terms to industrialists, it is now concentrating upon the development of the domestic load. At the end of June last year, the latest date for which figures are available, the Commission was supplying to about 150 rural towns and centres, including 100 which had no electrical service prior to its advent. There are approximately 40,000 consumers which take supplies direct from its mains, and in addition it supplies in bulk, mostly to metropolitan municipal undertakers, the number of whose consumers is approaching 250,000. In its own retail distribution areas, the Commission is exerting every effort to educate its consumers in the use of electricity for all household purposes. To this end it has created within its organisation a department composed of fully qualified men who combine the duties of supply engineers and sales experts. The activities of this department are having excellent results, and there is hardly a home in the Commission's areas which does not possess an electrical appliance of some kind. Many are fully equipped electrically, and generally throughout Victoria the electrical idea is rapidly developing, so much so that representations have been made to Parliament to enable municipal undertakers to establish showrooms and retail electrical appliances on the same lines as those followed by the Commission.

In practically all of its centres the Commission has well-equipped and attractive showrooms, fig. 2, in which demonstrations are given in the use of electric cookers, washing-machines, and a wide variety of other electrical appliances. Regularly it conducts " drives " for the sale of some particular appliance, advertising and distributing mail matter very freely. The results of such campaigns have exceeded all expectations, and whether the people in Victoria use electricity for all pur-

* Articles have also appeared frequently on the important developments in Australia, *e.g.*, the article on the Melbourne undertaking in our issue of April 18th, 1930, and one by Sir John Monash in our special issue of October 19th, 1928.

poses in their homes or not, the conviction is abroad that no home can be termed ideal which is not electrically equipped.

Assisting the propaganda that is being carried on is the domestic two-part tariff, consisting of a service charge per room and a small energy or unit charge. In the metropolitan area this charge is 1s. per room per month, and 1¼d. per kWh for the energy actually consumed. By virtue of the fact that the Commission has power to control the tariffs of those undertakings to which it supplies in bulk, this two-part domestic tariff is the standard metropolitan tariff. The service charge refers to main living rooms only, and exempts pantries, passages, halls, verandahs, cupboards, cellars, sculleries, and so on. As people realise the economical value of this tariff, the desire has grown to derive the fullest possible benefit from it, and it is not too much to predict that the time is not far distant when electricity will take the place of all other forms of domestic power, heat, and light in the State.

Another factor conducive to the more general use of electricity is that the scheme of supply is the people's own. It is based on the principle of service at cost, and the success which it has achieved is regarded with pride by the public. It is a scheme which appeals to the imagination, because it has lifted Victoria out of its condition of dependence upon outside sources of fuel supply for electrical and general commercial purposes, and not only has it made the State self-contained in the matter of electricity supply, but it has pointed the way to complete independence in the matter of fuel supplies for all purposes.

Fig. 1.—Yallourn Power Station; Coal Storage left, Switchyard right.

This naturally brings us to the gigantic works of open cut brown-coal winning at Yallourn, which forms part of one of the most extensve and accessible deposits of brown coal in the world. Every mechanical device for the large-scale winning of this coal on an economical basis has been installed at Yallourn, and on outputs of 10,000 tons per day which will be reached next year, the cost of delivery to either the power station or the briquette factory will be probably less than 2s. 6d. per ton. The existing power station at Yallourn, fig. 1, has a normal output of 62,500 kW, and work is now proceeding on the duplication of the station and of the transmitting and receiving facilities. At the same time, the briquette factory is also being extended, and it will, at the end of this year, be producing at the rate of nearly 400,000 tons of briquettes per year.

Fig. 2.—Demonstration Kitchen in Dandenong Showroom.

Yallourn is becoming one of the show places of the world, both from an engineering and a spectacular point of view, and no visitor to Australia wishing to know its potentialities and achievements leaves Yallourn out of his itinerary. Auxiliary to Yallourn is a hydro-electric scheme in the north-eastern part of the State. It is probable that the next increment of generating plant will be installed in this station, so that, with its hydro and thermal generating stations, Victoria will have a well-balanced scheme.

A New Radio-apparatus Factory.

Descriptive details of the recently-completed "Madrigal" works at Croydon, and brief particulars of the new instruments being manufactured therein.

SPECIALISATION pays! To be the first to market radio transformers accompanied by the publication of National Physical Laboratory test curves of performance implied, at the time, a policy not less progressive than courageous. This policy has been fully justified in practice, since imitation is the sincerest form of flattery. "R.I." products, instruments and components, have become too well known by merit for Radio Instruments, Ltd., to avoid increasing their productive facilities. Their up-to-date works incidentally enlarged the scope for practical application of the specialised experience and knowledge acquired from research under the guidance and managing directorship of Mr. J. Joseph, M.I.E.E., M.I.R.E.

Fig. 1.—The "Madrigal" Works.

Situated on a main road beside the Purley Way, near the Croydon aerodrome, the new brick-filled steel and concrete frame premises have been erected by Messrs. Bryce, Ltd., a branch of the Hackbridge Electric Construction Co., Ltd. The executive offices are accommodated in a fine two-storey building, some 80 by 30 feet, forming the front elevation of the factory (fig. 1). The premises are divided into a number of smaller offices for the various heads of departments, and light, airy rooms in which the general office staff is housed; fig. 2 is a typical example of the larger rooms.

The main building comprises three large bays, roofed in the saw-tooth pattern with north lights. Two of the bays serve as the main machine shop and the assembling section, a portion of which is illustrated in fig. 3. In all, some 28 long benches are fitted, a number of them being equipped with light lathes, drilling, and other small machines (fig. 3, background). Each machine bench is mounted on three heavy iron standards, the driving motor being bolted on a girder that is supported over the centre of the bench and carries all the counter shafts and striking gear, while the shafting is beneath the bench. Each machine bench is, therefore, entirely independent of the others, so that the power in use can be regulated according to the work passing through the shops.

The coil-winding machines are mounted on a number of these benches, and are electrically operated by independent motors, connection being made underneath the benches, which are also provided with gas points. The machine-shop equipment comprises a battery of "Bliss" presses for making small and large stampings, vertical and horizontal milling machines, grinding machines, rotary drills, capstan lathes, fret saws, buffs, and the various machine-tools essential for the equipment of an up-to-date instrument factory.

Adjoining the machine shop is a small, well-equipped wood-working room, where the teak cases are manufactured for apparatus ordered by Government Departments.

Fig. 2.—Section of General Office Accommodation.

The third bay is entirely devoted to the stores, packing, and dispatch departments. Adjacent to it a

wide road has been constructed on the works site, so that vans can drive in and deliver and collect goods alongside the stores and dispatch departments, which are fitted with sliding doors.

The buildings at present erected on the 2-acre site will accommodate between 400 and 500 hands, but sufficient land is available for future extensions to accommodate ultimately as many as 2,000 operatives. Good-class labour is available locally, most of the employés being men, though the coil-winding machines are attended by girls. Electrical energy is purchased on favourable terms from the Croydon Corporation, whose generating station and a section of a national grid overhead line are within view of the new factory.

The test room proper is spacious and well lighted, and equipped with modern apparatus for electrical and radio tests. The main feature is the distribution system; a switchboard (fig. 4) controlling a large number of circuits feeding 12 different testing benches is so arranged that any form of supply can be selected by simply plugging-in to a selector panel on each bench; the flexible rubber-sheathed cables suspended from the ceiling are visible in fig. 4. The chief circuits comprise: 400 volts d.c.; 220 volts d.c., battery; 230 volts d.c., generator; 230 volts a.c. mains, 50 cycles; 220 volts, alternator, 50 cycles; 230 volts, alternator, 25 cycles. The main switchboard gives control over two motor alternators, one of which is electrically reversible in operation according to the test-room requirements. This machine can be driven from the main d.c. battery, or from the 50-cycle mains supply at will, and can generate a.c. and d.c., respectively; the charging of the main d.c. battery is accomplished by its use. Others are charged from the Croydon Corporation a.c. mains by means of Westinghouse metal rectifiers.

Two testing benches are permanently fitted up for the measurement of inductance; on them all low-frequency chokes and high-frequency coils are tested. Another bench is permanently connected for the testing of capacity by the a.c. bridge method; here capacities from a fraction of a micro-microfarad up to 10 micro-farads can be immediately determined with the apparatus available. A further bench is arranged for high-voltage testing with a specially-constructed electrostatic voltmeter reading up to 30,000 volts, fitted in a glass case; high-voltage transformers for the supplies are situated beneath the bench.

Other benches are arranged for the testing of inter-valve transformers, and in this connection an interesting method of ascertaining the actual amplification of every transformer may be mentioned. The arrangement includes a special type of bridge and a mutual inductance; the transformer to be tested is pushed into a jig, which automatically makes spring connections to the terminals. Balance is obtained with telephones by a zero method, and the actual amplification is read from the dial of a Wheatstone bridge, thus enabling any transformer to be rejected which does not come within the specified limits; in other words, the test is a combination of visual and aural determinations.

Fig. 4.—Corner of the Test Room.

Other benches are equipped with testing instruments made by the Weston, Nalder, and Evershed companies for testing transformers for use with mains-operated sets and dry rectifiers. The transformers manufactured cover a very wide range, suitable for operation at any voltage and frequency in use throughout the country.

A section of the department is entirely devoted to the testing of apparatus manufactured for the Admiralty, War Office, Air Ministry, Post Office, and other Government Departments, while an inner room is set apart for research work on receivers under the direction of Mr. W. G. Hale, and facilities are also provided for the printing of drawings by up-to-date arc-lamp equipment. A wooden shed has also been erected as far away from the factory as possible for testing special receivers, so as to be entirely free from screening and interference from the electricity mains. Power for this testing shed is obtained from a special isolating transformer, filtered to eliminate all interference.

Fig. 3.—Portion of Main Assembly Bay.

An imposing double aerial, 60 ft. in height, is supported by two steel masts on the north side of the factory between the above-mentioned test hut and a handsome grey wood-panelled showroom on the ground floor of the administrative block close to the main entrance. The products displayed therein for inspection and demonstration include the new "Madrigal Four" receiver, which is generally similar to the 3-valve set described last year.* The range of the new instrument has, however, been further extended by the incorporation of two screen-grid h.f. amplifying valves, the added tuning circuit also improving selectivity. All the valves are of the indirectly-heated-filament pattern, the sets being mains operated entirely, d.c. and a.c., 50-

* See ELEC. REV., September 27th, 1929, p. 544.

cycle and 25-cycle models being available. The screening is thorough to avoid inter-stage coupling, and careful design has assured adequate stability, whilst extremely compact lay-out maintains modest over-all dimensions.

The h.f. couplings consist of tuned-grid circuits, choke fed from the h.f. valve anodes, the change-over from long- to medium-wave reception being affected by short-circuiting a section of each of the binocular astatic tuning inductances. The three main condensers are ganged in a sub-divided screening compartment centrally placed from front to back of the cabinet. The circuits are balanced by trimming condensers, which are adjusted when the set is tested at the works, but an additional trimming condenser is connected across the first tuned circuit for the purpose of compensating for the change of capacity when an external aerial is connected.

Volume is controlled by means of a potentiometer, which varies the screen-grid potential of the h.f. valves, whilst a neat switching system enables it to function as a volume controller when a gramophone pick-up is used as well. From the potentiometer is also derived the small positive bias needed for the leaky-grid detector valve, the negative bias necessary for gramophone record reproduction being provided by a resistance in series with the cathode; the grids of the h.f. and l.f. valves are biased in a similar way. To avoid grid-current damping, the detector is connected across one-half of the tuned circuit preceding it through a capacity potentiometer having one fixed and one variable condenser, so enabling the tapping to be adjusted and remain unchanged for long- and medium-wave operation, thus simplifying switching.

A " Hypermu " transformer couples the detector and single pentode l.f. amplifier valves, a resistance being inserted between the grid and secondary winding to suppress any h.f. current that gets past the detector. The output is through a 50-mA " Hypercore " choke-capacity coupling. An aluminium casting at the front of the chassis houses ingenious cam-operated switchgear that enables all the subsidiary controls to be operated by a single knob. The tops of the seven sheet-copper screening compartments are covered by a copper lid, above which is an earthed aluminium plate that prevents stray capacity coupling between the h.f. valve anodes.

In substitution for the conventional " earth," connection is made to the main transformer's primary winding through a condenser, the grid of the first h.f. valve being also at earth potential so far as radio-frequencies are concerned. Accordingly, the valve cathodes, the whole of the screening system, and the output leads, &c., act as a small aerial, which more than suffices for local reception. Whilst the arrangement is unusual, it nevertheless functions satisfactorily in practice, external capacity effects being negligible, and the performance of the set under such conditions must be heard to be really appreciated.

The practicability of dispensing with all external connections, apart from the mains power plug twin flexible connector, enables the receiver, when mounted on a pedestal having substantial rubber-tired castors, to be wheeled from room to room and used in the most convenient position. The pedestal may be utilised to accommodate a " Peter Grassman " moving-coil loud-speaker, complete with the requisite components for energising its field winding from the mains.

With electricity at 1d. per kWh, the energy cost of operating the outfit for 20 hours per week should not exceed 5s. per annum, or half that figure without the speaker.

The mahogany and walnut cabinet work is of a high standard, and the combination, having been designed with the primary aim of pure music and fidelity of speech reproduction, is capable of a performance which is distinctly above the average.

In conclusion, we are indebted to Radio Instruments, Ltd., for the facilities given us for the collection of the above information during a recent visit to the " Madrigal " works.

Electricity Supply Progress.—II.*

The main trends of development by authorised undertakers in Great Britain between the years 1921 and 1929, as revealed by official statistics.

By R. S. H.

C. Expenses.

THERE are three main expenses in the production and delivery of electricity, namely :—

1. Cost of fuel.
2. Interest and depreciation on the cost of generating stations.
3. Interest and depreciation on the cost of transmission and distribution systems.

There are other expenses of substantial total amount, but they are not of much interest to the practical man, and individually they are comparatively small; in any case their incidence in several cases is more often a matter of politics; they include such expenses as management, rents, assessed rates, and appropriations of profits to companies' dividends or to the relief of local rates; it is proposed therefore to examine movements in the three expenses enumerated above only.

1. *Cost of Fuel.*

As regards fuel costs, in view of the facts that at present over 95 per cent. of the electricity generated by authorised undertakers is from steam plant, and that nearly all steam is generated from coal, it is proposed to consider only coal costs, ignoring the costs of oil, gas, and other fuels.

The cost of coal per kWh sold may be resolved into four component parts :—

(*a*) Heat consumed per kWh generated.
(*b*) Heat content of the coal consumed.
(These two figures together give coal consumed per kWh generated.)
(*c*) Ratio of kWh generated to kWh finally sold to consumers.
(These figures together will give coal consumed per kWh sold to consumers.)
(*d*) Cost of coal per unit of weight.
(There can now be derived coal cost per kWh sold to consumers.)

Heat Consumed per kWh Generated.

Unfortunately the Commissioners did not publish a detailed fuel consumption return until that for the year 1925-6, so that it is possible to calculate an index figure as to heat consumption for the last four years only. The

* For Part I see Electrical Review, August 22nd, 1930.

following figures, which have been calculated from the fuel-consumption return by eliminating stations not appearing in "Engineering and Financial Statistics," indicate the progress made:—

Average number of B.th.u. consumed per kWh generated by A.U.

1925-6.	26-7.	27-8.	28-9.
25,540	24,590	22,750	22,130

Assuming a kWh to be equivalent to 3,415 B.th.u.'s, the average thermal efficiencies at the generating stations were:—13.37 per cent., 13.89 per cent., 15.01 per cent., and 15.43 per cent.; these figures correspond to the following average thermal efficiencies at consumers' terminals (*i.e.*, the proportion of heat fired in coal burnt at generating stations which reached consumers in the form of electrical energy):—10.76 per cent., 11.18 per cent., 12.08 per cent., and 12.42 per cent., respectively.

Of course broad averages are often not very helpful; if a further analysis of the individual figures can be made, interesting facts may be revealed, and in this direction the following table has been prepared:—

KWh generated at steam stations (owned by A.U.) having station generating thermal efficiencies within the ranges indicated for each year (thousand million kWh), fig. 1.

	Thermal efficiency.			
Year.	7% to 12%.	12% to 17%.	17% to 22%.	Total.
1925-6 ...	1.56	3.99	0.91	6.47
26-7 ...	1.03	4.25	1.26	6.55
27-8 ...	0.91	4.43	2.48	7.81
28-9 ...	0.73	5.11	3.25	9.09

It is obvious that the output of what the writer would designate (from a thermal efficiency point of view only) as first-class stations is increasing rapidly, that of second-class stations is increasing slowly, while the output of the lowest-grade stations is quickly falling away as it becomes profitable to install more efficient plant. The change is doubtless proceeding in several ways: the opening of new stations, the installation of new units in old stations, the better loading of the plant in old stations, and the growth of connected load with the increase of interconnection between stations.

Calorific Value of Coal Consumed.

The average calorific value of the coal consumed over the four years for which information is available moved roughly as follows (unfortunately no deeper analysis is readily available):—

Year.	1925-6.	26-7.	27-8.	28-9.
Average "gross" calorific value as fired of coal consumed, B.th.u.'s per lb.	10,680	10,140	10,650	10,950

The actual figures of coal consumed per kWh generated for the same four years and for preceding years for which more detailed information is not available were as follows:—

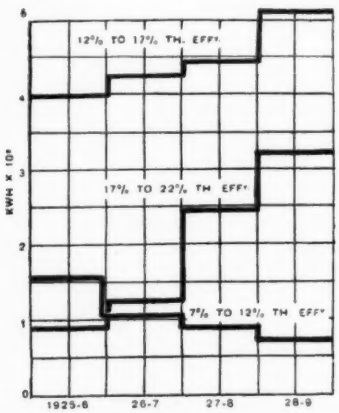


Fig. 1.—kWh Generated at Different Thermal Efficiencies.

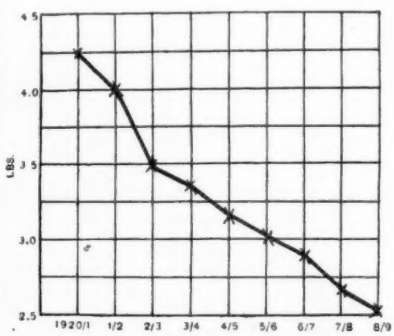


Fig. 2.—Coal Consumed per kWh Sold to Consumers.

Average coal consumption by A.U. steam plant per kWh generated.

Year.	1920-1.	21-2.	22-3.	23-4.	24-5.	25-6.	26-7.	27-8.	28-9.
Lb. coal per kWh	3.42	3.25	2.79	2.71	2.55	2.43	2.33	2.16	2.04

The ratio of kWh generated to kWh sold to consumers is assumed to be constant at 1 : 0.805, so the following figures are derived:—

Average coal consumption by A.U. steam plant per kWh sold to consumers, fig. 2.

Year.	1920-1.	21-2.	22-3.	23-4.	24-5.	25-6.	26-7.	27-8.	28-9.
Lb. coal per kWh	4.24	4.03	3.47	3.37	3.17	3.02	2.90	2.68	2.53

These last figures are not a very accurate index as to thermal efficiency, for (as was shown above) the average heat content of the coal used varies substantially.

In the two graphs, figs. 3 and 4, are shown the more important figures relating to fuel consumption.

According to the Commissioners' tables the average cost of coal per ton is as follows:—

Average cost of coal and coke per ton delivered to power stations.

1921-2.	22-3.	23-4.	24-5.	25-6.	26-7.	27-8.	28-9.
s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
35 0	20 5	20 2	20 8	18 0	31 2	17 10	15 7

Applying these figures to those in the preceding table we are able to derive the following figures:—

Average cost of coal in pence per kWh sold to consumers, fig. 3.

1921-2.	22-3.	23-4.	24-5.	25-6.	26-7.	27-8.	28-9.
0.756	0.380	0.364	0.351	0.291	0.484	0.256	0.211

These figures can be checked by calculation from the actual total fuel cost in "Engineering and Financial Statistics." These alternative figures are:—0.757, 0.381, 0.363, 0.352, 0.292, 0.485, 0.257, 0.211.

This is fairly satisfactory, for it appears that to consider coal only does not seriously affect the overall figures.

2. *Interest and Depreciation on the Cost of Generating Stations.*

For the purposes of this article it is proposed to assume that interest is payable at a rate of 5½ per cent. on original capital expenditure, and that sinking-fund contributions are set aside to accumulate with net interest at 4½ per cent., the actual contributions being roughly in accordance with the Commissioners' loan periods as set out on p. 133 of their Seventh Annual Report.

The incidence of capital charges on the cost of generating stations per kWh sold to consumers may be subdivided as follows:—

(*a*) Capital cost of generating stations per kW of generator capacity.

(*b*) Capital charges as a percentage of capital cost giving capital charges per kW of generator capacity.

(*c*) kWh sold per kW of maximum demand (or load factor based on maximum demand).

(*d*) Percentage of reserve-plant capacity against actual maximum load.

From the foregoing figures there can be derived:—

(*e*) kWh sold to consumers per kW of generator capacity.

(*f*) Capital charges per kWh sold to consumers.

The actual figures are approximately as follows (plant and outputs of A.U.'s only).

Capital Expenditure per kW of Generating Plant.

(*a*) Total capital expenditure on generation (a proportion of "miscellaneous" capital expenditure has been added).

Year.	1921-2.	22-3.	23-4.	24-5.	25-6.	26-7.	27-8.	28-9.
£ millions	69.8	77.1	83.9	91.4	98.9	104.0	116.1	127.0

(*b*) Approximate total capacity of generating plant installed (after slight adjustment for changes in ratings).

Million kW ...	2.94	3.24	3.55	3.85	4.42	4.68	5.26	5.80

(*c*) Capital expenditure per kW of generating plant.

£ ...	23.8	23.8	23.7	23.7	22.4	22.2	22.1	21.9

Capital Charges as a Percentage of Original Capital Cost.

It has been found that annual depreciation provision in respect of the cost of generating stations calculated roughly in accordance with the Commissioners' loan periods amounts to something between 2.69 per cent. and 2.75 per cent. of the original capital expenditure for the period of years under review. It is therefore proposed to assume that capital charges in respect of generating stations amount annually to 8¼ per cent. of the capital expenditure giving the following figures :—

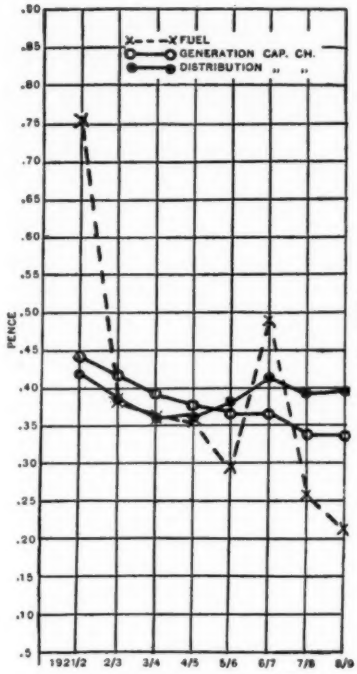


Fig. 3.—Costs per kWh Sold to Consumers.

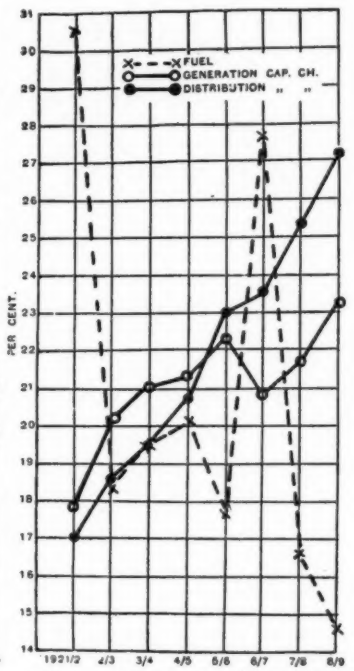


Fig. 4.—Costs as a Percentage of the Year's Revenue.

Annual capital charges, £ per kW of generator capacity.

1921-2.	22-3.	23-4.	24-5.	25-6.	26-7.	27-8.	28-9.
1.96	1.96	1.95	1.96	1.85	1.83	1.82	1.81

kWh generated in stations of A.U. and sold to consumers per kW of annual maximum demand on such stations.

(*a*) Sum of annual maximum loads on generating stations of A.U.

Year.	1920-1.	21.2.	22-3.	23-4.	24-5.	25-6.	26-7.	27-8.	28-9.
Million kW	1.63	1.64	1.83	2.07	2.30	2.56	2.70	3.24	3.37

(*b*) Of course, as with distribution capital charges, the greater the number of kWh sold in a year per kW of maximum demand the smaller is the incidence of capital charges, for their total amount is more nearly proportionate to the demand than to the kWh output over a period. The greatest number of kWh which can be generated per kW of generator maximum load in an ordinary year is 8,760, and therefore with the present transmission and distribution efficiency the maximum number which can be sold is $8,760 \times 0.805 = 7,052$. The actual figures for the years in question, and corresponding percentages, were as follows :—

KWh sold per kW of maximum load
(*i.e.*, kWh generated at A.U. stations × 0.805 ÷ Sum of maximum loads).

Year.	1920-1.	21-2.	22-3.	23-4.	24-5.	25-6.	26-7.	27-8.	28-9.
kWh	2,110	1,910	2,000	2,050	2,110	2,080	2,080	2,100	2,230
Load factor %	30.0	27.1	28.3	29.1	29.9	29.5	29.5	29.8	31.6

Total capacity of generating plant installed as a percentage of the sum of maximum loads.

%	162	179	177	171	168	173	173	163	172

KWh sold per kW of generating plant in A.U. stations.

kWh	1,310	1,070	1,130	1,200	1,260	1,200	1,200	1,290	1,290
Load factor %	18.6	15.1	16.0	17.0	17.9	17.0	17.0	18.4	18.4

Capital charges on generation capital expediture in pence per kWh sold to consumers.

0.441	0.417	0.390	0.373	0.368	0.366	0.338	0.336

3. *Interest and Depreciation on Cost of Transmission and Distribution Systems.*

There is available no information as to the capacity and degree of utilisation of transmission and distribution systems, and the only useful figure available is that already set out under the heading " kWh sold per kW of annual maximum load on generators," when the question of generation capital charges was under consideration. The total capital expenditure (in millions of pounds) on transmission and distribution was as follows :—

1921-2.	22-3.	23-4.	24-5.	25-6.	26-7.	27-8.	28-9.
69.0	75.8	84.2	96.2	110.8	126.2	143.1	159.8

These figures are inclusive of a proportion of " miscellaneous " capital expenditure, but they exclude expenditure on meters and hired apparatus. The last two items are excluded, first, because such expenditure is often not charged to capital account, and, secondly, because there are usually special rentals designed to cover all the costs of such installations. It has been calculated that annual depreciation based on the Commissioners' loan periods has moved during the period between 2.4 per cent. and 2.36 per cent. of the original capital expenditure and has a steadily downward tendency. It is proposed therefore to assume that the annual capital charges on the cost of transmission and distribution systems amount to 8 per cent. of the original capital expenditure.

It will be found that transmission and distribution capital charges per kWh sold to consumers (whether from A.U. stations or not) were as follows :—

Capital charges, transmission and distribution, in pence per kWh sold.

1921-2.	22-3.	23-4.	24-5.	25-6.	26-7.	27-8.	28-9.
0.421	0.384	0.362	0.363	0.379	0.413	0.392	0.393

The three expenses which have been examined and the three corresponding revenues may be tabulated as follows :—

Costs and average revenue in pence per kWh sold to final consumers.

Fuel cost ...	0.757	0.381	0.363	0.352	0.292	0.485	0.257	0.211
Capital charges :—								
Generation ...	0.441	0.417	0.390	0.373	0.368	0.366	0.338	0.336
Distribution ...	0.421	0.384	0.362	0.363	0.379	0.413	0.392	0.393
Total ...	1.619	1.182	1.115	1.088	1.039	1.264	0.987	0.940
Revenue ...	2.482	2.072	1.857	1.747	1.649	1.759	1.554	1.446

The changes in the figures may be better grasped by considering each as a percentage of what it was in the year 1922-23 (1921-22 is not used as the basic year because it was abnormal).

Above figures as a percentage of 1922-23 figure.

Fuel cost ...	198.9	100.0	95.2	92.4	76.7	127.4	67.6	55.4
Capital charges :—								
Generation ...	105.8	100.0	93.5	89.5	88.2	87.8	81.1	80.6
Distribution ...	109.6	100.0	94.3	94.4	98.8	107.5	102.2	102.5
Overall ...	137.0	100.0	94.3	92.0	87.9	106.9	83.5	79.5
Revenue ...	119.8	100.0	89.6	84.3	79.6	84.9	75.0	69.8

It is of interest, and certainly of greater importance, to set out these costs as a percentage of the corresponding revenue.

Costs set out above as proportion of each year's revenue, fig. 4.								
Fuel % ...	30.5	18.4	19.5	20.1	17.7	27.6	16.6	14.6
Capital charges :—								
Generation % ...	17.8	20.2	21.0	21.3	22.3	20.8	21.7	23.2
Distribution %	17.0	18.6	19.5	20.7	23.0	23.5	25.3	27.2
Total ...	65.3	57.2	60.0	62.1	63.0	71.9	63.6	65.0
Year's Revenue	100	100	100	100	100	100	100	100

It will be observed that the actual and the proportionate costs of fuel have declined, the actual cost of generation capital charges has declined while the proportionate cost has increased, and that the actual cost of distribution capital charges has remained more or less steady, so that with a decreasing revenue the proportionate cost has increased.

In the concluding graphs are shown the actual and relative weights of the expenses items which have just been considered.

The following observations on the foregoing figures can be offered :—

The domestic load appears to fluctuate from year to year much less than the industrial load, and as in this way it offers a more assured revenue it seems worthy of very active development, provided that as the result of proper cost accounting such tariffs have been so designed as to make this class of supply both attractive to consumers and profitable to the electricity supply undertaking. Moreover, the domestic load appears to offer a huge potential market, for one hears that quite small electric houses consume 4,000 kWh per year; if this market be developed to a substantial extent the output of the electricity supply industry will grow enormously, and, because of resultant production cost economies, supply authorities will be enabled to reduce still further their charges to industrial consumers with, we hope, corresponding benefit to such industries and to the unemployment problem generally.

It is clear that the costs of fuel and of capital charges on the cost of generating stations are now exceeded by the weight of capital charges on the cost of transmission and distribution systems, and to this last item much attention must now be given. The operations of the Central Electricity Board will have the effect of still further reducing the costs of fuel and generation capital charges, while, as its function is to displace reserve generating plant by transmission lines of lower annual total cost, transmission capital charges will be higher than at present. Further, as the cost of current in bulk becomes cheaper, it will be profitable to offer supplies in districts such as rural areas where, owing to heavy distribution costs, it has not hitherto been profitable.

Thus, for two reasons capital charges on the costs of transmission and distribution systems are likely under present conditions and with existing methods to become even heavier than they are already.

Electricity in Agriculture.

Some Examples of Recent Applications of Electricity in the Rural Areas of Great Britain

By C. A. CAMERON BROWN.

(Abstract of a paper read before the Second World Power Conference.)

THE use of electricity for agricultural purposes may be divided broadly into (*a*) new processes, and (*b*) substitution processes. Under (*a*) come such applications as electroculture, electrosilage, and reduction of ploughing draught, and under (*b*) come farmyard power drive, heating of food, lighting, &c.

The development of new processes involves a considerable amount of experimental work, largely of a laboratory nature. In 1918 the Ministry of Agriculture appointed an Electro-Culture Committee which, in its third interim report, gave the general conclusions from field experiments from 1915 onwards, these demonstrating that the effect of electrification on the yield of spring-sown oats and barley was an average increase of 22 per cent. In 1922 a field installation was erected under conditions common to full-scale farming; the cost of this, owing to the small area covered, worked out at about £10 per acre, while private estimates submitted for larger installations worked out at just over £2 per acre. Thus the principle, as far as official investigation goes, can hardly yet be taken as offering successful application.

An experiment was carried out on a Scottish farm, during the winters of 1926-27 and 1927-28, to determine the result of treating store cattle with ultra-violet light under the average conditions. The results indicated that, for fattening cattle there is no consequent benefit under ordinary conditions of feeding. The apparatus consisted of a 500-W mercury vapour lamp used for about one hour daily for about five months, consuming some 75 kWh.

Successful results with electrically-heated garden frames have been reported from America and Scandinavia. Dr. Bewley, working at Cheshunt Experimental and Research Station, finds that while electrical heating of the soil naturally increases the tomato crop, it is insufficient to repay the cost of energy used. The cost of heating during March, April and May, from 10 p.m. to 6 a.m. daily, was: 65 deg. F, £80 per acre; 67 deg. to 70 deg. F, £100; 72 deg. to 75 deg. F, £125; and 77 deg. to 80 deg. F, £150. In the first and third cases there was a loss of £54 and £41 per acre, respectively; in the last case there was a profit of £12. In the second case disease developed in the crop and the loss was disproportionately heavy. Profit and loss are the net increase or decrease in money value over the control crop which was not heated. If the cost of current were halved there would still be a loss in the first case, a small profit in the third, and a considerable profit in the last case.

Among "farmyard" or "barnyard" machinery the threshing machine deserves first mention. The built-in motor, which manufacturers now supply, makes the threshing machine entirely self-contained, but it is questionable whether it is economical to confine so large a motor to work which is of comparatively short duration. The requirements of threshing would seem to be adequately met by a portable motor, which would normally be used for the barn power drive or for miscellaneous farmyard work such as sawing, silage-cutting, &c. In the course of tests recently conducted by the Institute of Agricultural Engineering, Oxford, it was found that a threshing machine with a 4.5 foot drum operated by the ordinary farm hands would be adequately powered by a portable motor of about 15 h.p.

One of the minor advantages of electric working is the ease with which the power required for any operation can be measured. In the tests to which reference has just been made it was seen that while an old-fashioned horizontal stone grinding mill required some 10 h.p., another modern high-speed mill required only some 4.0 h.p., although its output was 50 per cent. higher and the quality of the work much the same. The former machine consumed 2.26 kWh per cwt. of grain ground, whereas the latter consumed only 0.75 kWh.

The usual power operations, churning, separating, pumping, &c. are straightforward. Development is taking place only in detail and in perfecting common principles. The use of power for refrigerating machines is beginning to be a substantial item in the year's consumption of energy. One large dairy plant, which included an ammonia compressor, required a 10-h.p. motor consuming 16,000 kWh per annum.

The introduction of the electric motor to the farm has intensified interest, and controversy, in the mechanical milking plant. Prejudice is disappearing and some notable installa-

tions have been made. There is now plenty of testimony to the economic soundness of mechanical milking. There is still, however, some apprehension as to the danger of a failure of the electricity supply; this can be a particularly serious occurrence in all dairy work, and statistics showing the percentage of power failures to be actually very low would have an encouraging result.

There has been a tendency to assume that, while mechanical milking is satisfactory in the big farms and for large herds, such as those of dairy combines, it is not such an economical proposition for small herds. As a matter of fact, the small dairy-farmer is even more urgently in need of power than the large farmer. The author has visited a small dairy farm in Buckinghamshire where the farmer, unaided, runs an Alfa-Laval milking plant serving a herd of 25 cows. The water for washing and sterilising is heated electrically in a special heater hired from the Aylesbury Supply Department. Three milking units are used, and a 2-h.p. motor drives both milking-machine pump and a water pump used in conjunction with a milk cooler. From February to November the consumption averaged 88 kWh per month, or 42 kWh per cow per year (including consumption for pumping water to cooler). The 3-kW hot-water boiler consumed on an average 74 kWh per month. After over two years' experience the farmer is very well satisfied with his investment.

A somewhat larger farm in Hampshire has a herd of 64 cows milked by a "Vaccar" plant. The consumption works out roughly at some 150 kWh per month, or approximately 28 kWh per cow per year. The saving by using the mechanical milking plant in place of all hand labour has been calculated at some £213 per annum; the installation has been in use for four years.

The open-air milking system is making headway in this country; under this system the cows are kept in the open-air all the year round, milking being carried out in the field. For this purpose a portable milking outfit is used, consisting of a wheeled shed holding six or so stalls and a mechanical milking plant. The outfit is moved over the field from time to time, so that if electricity were used several supply points would be required. The larger farms might be able to contemplate a field supply system which would enable electricity to be used in these open-air outfits.

Poultry farmers are rapidly installing electrically-heated incubators and brooders and electric lighting in the poultry houses. On the larger farms, with outputs amounting to some 100,000 chicks per annum, the electrical method is particularly desirable, because of the ease of automatic control and simplicity of starting. The Corstophine Poultry Farm of the Buttercup Dairy Company is a large farm of this type which is equipped with electrically-heated incubators and brooders and electrically-lit laying sheds; automatic control is used throughout.

At the same time, smaller farms find electrical equipment worth while, and satisfactory results can be obtained without the additional expense of automatic control mechanism. The Wichendon farm uses electric light in the laying sheds. There are five of these, each containing 100 birds and each equipped with two 100-watt gasfilled lamps, giving a maximum load of 1 kW. The installation is in use in the winter months. The lights are switched on at a low intensity, which is gradually increased until they are full on at 7 a.m., and are switched off when daylight is full. In the evening full light is switched on when daylight is still full; at 7 p.m. dimming starts and the lights are extinguished at 7.30 p.m. The gradual dimming is controlled by hand, a sliding rheostat in a central position being used for the purpose; the whole process is carried out by a series of adjustments of the rheostat at five-minute intervals over the half-hour. From October 17th, 1928, to May 16th, 1929, the total consumption for lighting was 956 kWh. The heaviest consumption was in January; very little electricity was used at the beginning and end of the period. Brooding is carried out at this farm by the old oil lamp methods, but the Eythorpe farm on the same estate has 12 electrically-heated brooders each containing 50 chickens. A very simple heater is used consisting of a two-gallon galvanised tin filled with water and fitted with a 250-watt immersion heater. Each of the brooders has two of these heaters, which are wired and switched to give either parallel running (quick heat) or series running (slow heat). The latter is used for a steady "maintaining" heat, when the load on each heater is 125 watts. The maximum load of the installation is 6 kW when all the heaters are in parallel. For steady night running the load is 1.5 kW. The actual consumption of energy over a period of about nine months (November 14th, 1928, to August 13th, 1929) was 3,603 kWh, corresponding to an output of 1,600 chickens. There has been no trouble due to lack of automatic control, and one man runs the establishment. It might be added that by a special method of mounting the heaters on short legs a close approximation to natural conditions is obtained, since the chickens go underneath and dangerous crowding is obviated.

Artificial drying of hay and corn crops has only made use of electricity for power to drive a fan; electrical heating of the drying air has been quite out of the question owing to cost and comparatively low value of the product. More valuable crops, such as hops, which have a market value of the order of £70 per ton, offer more promising prospects, as the quality largely depends on the careful regulation of the heat supplied. The research department of the Shropshire, Worcestershire and Staffordshire Electric Power Company began experiments in 1928 with the object of determining whether the use of electric heat for the drying of hops was economical.

The hops were dried in a small enclosed tray. Table I gives a summary of the results of three tests: the figures are given by the courtesy of Mr. J. T. H. Legge, the managing director.

TABLE I.

Weight of hops, dry. lb.	Time to dry. hours	lb./hr.	kWh for heat and power.	Cost per ton (dry) at 1d. per kWh. £
60	6.5	28.3	139	21.65
86	8.75	31.3	190	20.65
62	7.25	29.0	132	19.90

The average input to the fan motor varied between 2 kW and 3 kW on the different tests.

A paddle fan draws cold air through a preheating chamber —this allows some of the heat from the warm exhaust air to be transferred to the cold air—and then forces it over a series of electrical heating grids. The hot air then passes into the drying chamber, where it rises through the tray containing hops, and after passing through the preheater it is discharged. The heating grids can be loaded at from 18 to 24 kW. The fan is driven by a 2-h.p. motor. Three-phase alternating current was used throughout. The cost of current worked out at about £20 per ton of dried hops, and the quality of hops obtained was good. This is a high figure for cost, but it must be realised that the apparatus used was experimental, and it is not at all unreasonable to expect that the overall efficiency of heating and drying will be doubled. If anticipations are realised and costs are reduced to £10 per ton the process will be a definite success.

The idea of an electrical tractor has not been without attraction for engineers in this country. There is, of course, no difficulty in incorporating an electric motor in a land tractor. The difficulty lies in the evolution of a successful method of handling the "trailing cable" by means of which power is conveyed from some stationary point to the moving machine.

Meanwhile, Major A. McDowall in Scotland has been experimenting with an electric tractor fed by means of a flexible cable; a machine is now nearing completion in the workshops and has actually been under power. The idea is to produce a machine which will not require turning at the headlands, but which will travel up and down the field, moving sideways at the end of each set of furrows and returning parallel to, but one ploughing breadth away from, the previous bout. The flexible cable has simply to be paid out and laid down on the ground, and picked up on the return journey, with a minimum of dragging. The tractor consists essentially of a rectangular chassis supported on two broad cylinders inside and at opposite ends of the chassis; these drums act as the land wheels. The power is provided by two 12.5-h.p. motors mounted one inside each wheel. The wheel is not keyed to its axle, but rotates freely round it on a bearing at each end. The motor is suspended rigidly from the axle, and the driving pinion engages in teeth cut on the inside of the wheel rim. The cables to the motor are carried through the tubular axle. At each end of the wheel a considerable length of axle protrudes. One of these ends is pivoted to the chassis; the other end is held in a sliding box on the other side of the chassis. One wheel assembly is fitted towards the front end of the chassis, and the other towards the back with the pivoted ends of the axles at the same side of the machine. It is possible, therefore, to move the wheels about the respective pivots so that they are either parallel to each other, at an angle to the chassis, or inclined towards or away from each other. Steering is controlled by a horizontal steering rod which is threaded to engage with a right-hand threaded lug fitted to one sliding box, and with a left-hand threaded lug fitted to the other sliding box. Thus, according to the direction in which the rod is turned, the drum-wheels are drawn together or pushed apart and the tractor bears right or left accordingly; the horizontal steering rod is coupled by bevel gear to a vertical steering column. A hinged plough is carried at either end and is lowered or raised as required.

Normally the two sliding boxes are kept in engagement with their respective threaded lugs by means of a locking device. At the end of each ploughing bout this lock is released and the motors are reversed; since there is nothing to take the thrust, each drum wheel swings backwards, pivoting about one end of the axle, until the end of the sliding box is reached, when the motor is stopped. At this stage the plough is still in the ground, the tractor is lying in the direction of ploughing, and the drum-wheels are parallel to each other, but inclined towards the unploughed land; actually the wheels move through an angle of 20 degrees. The plough is then raised from the ground and all is clear for moving obliquely, sideways. The motors are again started, and, since the limit of the free movement of the wheels has been reached, the whole tractor moves bodily sideways at an angle of 20 degrees to the furrows and away from the headland until it has gained sufficient flank ground for the return bout; during this movement the main frame of the tractor has retained parallelism with the furrows. There is now space between the tractor and the headland, and the second plough is lowered. The motors are now run in the original ploughing direction, and the drum-wheels, being free, return until they are stopped and locked in the central position. The tractor is now ready for normal steering and the return bout is begun.

The cable is fixed to the supply line at one end of the field, and on the outgoing bout the cable is paid straight off the cable drum on the tractor by the pull of the cable. On the return journey the cable drum must be driven so as to pick up the cable. This is effected by an extra trailing wheel which is driven by ground contact regulated by a tension spring. If the cable is being overwound the wheel slips on the ground and eases the drive. On the outgoing journey a one-way ratchet gear allows the cable drum wheel to run free.

The stumbling block in all electric tractor designs is just this question of the supply cable. It will be interesting to see if the McDowall tractor has surmounted the difficulties associated with the necessity of supplying a moving machine by means of a flexible lead to a fixed supply point. The cable is an expensive item, and it is important that it should not suffer much wear and tear when in use. It might be pointed out, further, that the system of manœuvring adopted requires a minimum of effort on the part of the driver; all headland steering is done under power and there should be little disturbance of the ground.

Messrs. Doods & Clark, of Haddington, exhibited at the Highland Show, 1928, an electric tractor of their manufacture. This had a four-wheeled chassis in which the wheels could be turned obliquely to the chassis and parallel to each other. The system of manœuvring was much the same as Major McDowall uses. The cable gear was housed in the roof of the tractor and used the sliding-sheave principle of the captive balloon outfit.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

Central Electricity Board Contracts.

Further contracts amounting to about £600,000 have been placed by the Central Electricity Board. These include a large contract for general cables in connection with the South-East England Electricity Scheme placed with W. T. Henley's Telegraph Works Co., Ltd.; a contract for general meters required for the Central England Scheme placed with Messrs. Chamberlain & Hookham, Ltd.; and a contract for switchgear, which has been given to Messrs A. Reyrolle & Co., Ltd., and is the first so far placed by the Board in connection with the North-East England Scheme. These bring the total value of the contracts so far placed by the Board to about £12,000,000.

Wages in the Cable-making Industry.

The Joint Industrial Council for the Electrical Cable-making Industry informs us that there will be no "cost-of-living" alteration in wages in the industry on the third pay-day in September.

American Electrical Manufacturers and the New Tariff.

Possible effects on electrical manufacturers of the new Tariff Law were outlined by the Tariff Committee of the American National Electrical Manufacturers' Association in a recent report. It was stated in this that the important change was the insertion of the new paragraph 353, prepared as a result of the work of the Committee which for the first time definitely segregated the bulk of electrical products in terms so clearly stated that there could be little opportunity for misinterpretation. This paragraph is worded as follows:—"All articles suitable for producing, rectifying, modifying, controlling, or distributing electrical energy; electrical telegraph (including printing and typewriting), telephone, signaling, radio, welding, ignition, wiring, therapeutic, and X-ray apparatus, instruments (other than laboratory), and devices; and articles having as an essential feature an electrical element or device, such as electric motors, fans, locomotives, portable tools, furnaces, heaters, ovens, ranges, washing machines, refrigerators, and signs; all the foregoing, and parts thereof, finished or unfinished, wholly or in chief value of metal, and not specially provided for, 35 per cent. *ad valorem*."

In the Tariff Act of 1922 the intention of Congress was clearly to classify electrical products in general under the "basket" clause of the Metals Schedule at 40 per cent. duty, but a new definition of "machines," adopted by the courts, resulted in most of this material being imported under the heading of "machines" at a duty of 30 per cent. The new paragraph removed all uncertainty as to classification and provided a rate somewhat less than the Committee requested, but greater than that actually applied in most instances in the past. The wording of the paragraph was, also, carefully arranged to make proper provision for the duty on parts of electrical devices. Under the old law, parts of machines were imported at the same rate as complete machines; namely, 30 per cent., irrespective of the material from which they were made, and porcelain bushing, for oil circuit-breakers, for instance, were imported at that rate of duty instead of 60 per cent., which should have applied in accordance with the rate on articles composed of porcelain. The new paragraph covered parts of electrical devices only where they were made wholly or in chief value of metal. If the material of which they were chiefly composed was other than metal, they would, therefore, automatically be classified under their proper paragraphs.

A Cable Discussion at Dundee.

The question of foreign *versus* British cables was again discussed by the Dundee Corporation Electricity Committee at its last meeting. Tenders submitted for six different lots showed a total difference of £333 between the British tenders of £2,547 and those from foreign offerers. In one instance the foreign tender was 27 per cent. below the lowest British offer. Lord Provost Johnston moved that the whole of the work should be given to British firms. He said that the total difference of 15½ per cent. represented the difference in the wages paid in this country as compared with the Continent. The Convener of the Committee opposed and moved the acceptance of the lowest offers. This amendment failed to find a seconder. It was also moved that the Committee should accept the lower offers where the difference was not more than 15 per cent. This was rejected also and the Lord Provost's motion was carried.

Transporter Accident at Glasgow.

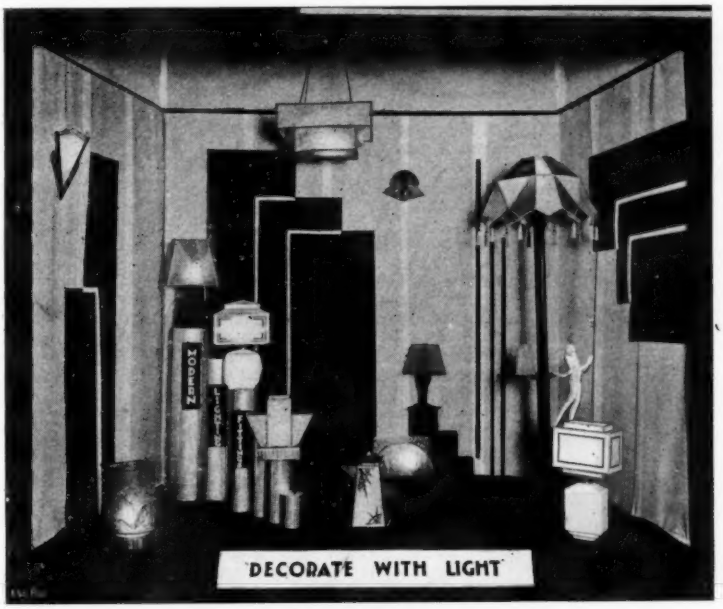
At a special meeting of Glasgow Corporation Cleansing Committee, the Director of Cleansing reported that on July 26th the transporter gear at the refuse power works, Govan, collapsed, and an employé was killed. Messrs. Heenan & Froude, Ltd., the contractors for the construction of the works, and Royce, Ltd., their sub-contractors, who had supplied the plant, had declined to accept any liability for the failure of the plant. It was essential that a new transporter be supplied immediately, but Royce, Ltd., would not proceed with the work unless they were given an assurance as to payment by the Corporation of the cost thereof, £850, without question as to any liability for reinstatement of the damaged plant. The Committee instructed the Town Clerk to communicate with Messrs. Heenan & Froude, Ltd., requesting them to arrange as part of their contract to supply and erect a new transporter at the earliest possible moment, leaving for subsequent determination all questions as to the payment therefor, and as to any question of compensation payable to the Corporation in respect of its losses. The Town Clerk reported that Mr. R. A. Raphael, M.I.Mech.E., had been engaged to act on behalf of the Department in the matter. At a later meeting of the Committee (August 12th) the Town Clerk reported that Heenan & Froude, Ltd., had said that they would supply and erect the transporter only on the understanding that it was regarded as a separate issue to the original contract. The Committee instructed the Town Clerk to ask Messrs. Heenan & Froude, Ltd., to supply and erect a transporter forthwith on the understanding that the new plant would be treated as a separate issue to the contract, the Corporation paying the cost thereof in the first instance.

New Belgian Company.

The Société Générale Africaine d'Electricité ("Sagelec") is the name of a company which has lately been formed in Brussels, with a capital of about £457,000, to operate concessions for the supply of electrical energy for lighting and power purposes in Elisabethville and Panda-Likasi, Belgian Congo.

Employment during July.

The August *Ministry of Labour Gazette* states that employment in the engineering industry during July continued bad and declined still further, particularly in the Midlands Division. In electrical engineering employment was only moderate. Compared with a year ago employment was much worse in all sections and in all areas. The total number of unemployed in the engineering industry as a whole rose from 145,650 to 161,006, the proportion increasing from 14.5 to 16.0 per cent. In the electrical engineering section the total was 7,084 (against 6,652) and the proportion 8.4 per cent. (against 7.9 per cent.). The increase in unemployment in the electric cable, wire, and lamp manufacturing group also continued, the total number of unemployed rising from 8,316 to 8,783 (from 8.8 to 9.3 per cent.). The electrical wiring and contracting industry reported 2,074 unemployed (against 1,898) raising the proportion from 11.4 to 12.5 per cent.



The E.D.A. Window Display for September.

Unemployment.

There was a further increase of 39,270 in the number of registered unemployed during the week ended August 11th. At that date the total was 2,050,737, as compared with 2,011,467 on July 28th, and 1,168,068 on August 12th, 1929. No figures are available for August 4th due to the incidence of the Bank Holiday. It is estimated that on July 21st there were approximately 9,584,700 insured persons aged 16 to 64 in employment in Great Britain. This was 134,700 fewer than a month before and 702,300 fewer than a year before.

Irish Free State Electrical Imports.

The Irish Free State Department of Industry and Commerce has recently altered the form of its returns of imports and exports. In future the detailed figures with regard to the imports of electrical machinery and apparatus hitherto issued quarterly are only to be published annually. On the other hand, the monthly returns which have so far only given aggregate totals have been slightly amplified. It is from these that we have compiled the appended table showing the imports into the Free State during the six months ended with June last as compared with the first half of 1929. It will be seen that while there has been a little more activity in two of the items, this was more than offset by the decrease in the others, the half year's imports showing in the aggregate a falling off of £66,205 or over 13 per cent.

	January to June. 1930.	1929.
	£	£
Electrical machinery	156,046	192,882
Electric wires and cables (insulated) ..	95,650	102,781
Wireless sets and parts	43,615	40,052
Electric lamps and parts	45,803	36,595
Other electrical goods and apparatus ...	97,280	132,289
Totals	£438,394	£504,599

Kolster Radio Re-organisation.

The *Financial Times* states the proposed plan for the reorganisation of the Kolster Radio Corporation (whose British subsidiary is Kolster-Brandes, Ltd.) provides for the formation of a new company with a capital of 5,000,000 shares of no par value of common stock and $4,500,000 6 per cent. 10-year convertible debenture notes. The present stock-holders will receive one new share for each three common shares and two new shares for each existing preferred share. Messrs. Woodard & Co. have agreed to take up a sufficient number of shares, at $9 each, or notes at 90 per cent., to furnish the company with $4,050,000.

Foreign Motors in New Zealand.

In the course of an article on conditions in New Zealand, the Wellington correspondent of the *Chamber of Commerce Journal* says that the sentiment of preference for British goods remains sound. "Value and service count rather more than price, but the latter is always an important consideration. As an instance, it may be mentioned that dairy farmers in the Thames Valley area require electric motors in their milking sheds, and the Power Board (the authority distributing energy generated at the Government hydro-electric stations) has put in Swedish and American motors. This has been resented by some dairymen who, without questioning the efficiency of the foreign articles, have represented to the Board their preference for British motors."

The E.D.A. Programme for September.

As September marks the commencement of the E.D.A.-E.L.M.A. Shop and Display Lighting Campaign, it is natural that this subject should loom large in the September programme of the British Electrical Development Association. The programme acts as a reminder that the two of the three direct mail appeals will be made on September 22nd and 29th to 200,000 shopkeepers as a preliminary to the establishment of personal contact between these prospective customers of the industry and local representatives of the industry. A list is given of over 40 specialist journals, covering a similar number of trades, in which a series of advertisements is to appear. Two of these advertisements are reproduced in the programme and they are seen to be very telling announcements.

Other activities are not neglected, however, and on the domestic side the main effort will also relate to lighting. An effective window display has been designed in which the use of modern fittings is advocated. This display is depicted in the accompanying illustration. A black and white colour scheme is employed. The "aids" available to contractors, retailers, and others include a specially-prepared advertisement for use in local newspapers, and a selection of appropriate "literature," and posters. It is also noted that a revised and improved edition of the booklet "Twentieth Century Cooking" (E.D.A. 297/1) is now available. Although a little dearer than the generality of E.D.A. publicity matter, this useful little handbook should prove a very effective way of securing satisfied customers. The programme concludes with some notes by the Director in which he says that his recent visit to the United States has shown him how great a scope exists for raising the standard of lighting in this country.

New French Companies.

Among the companies recently formed in France are the Société Nouvelle d'Electricité et de Chauffage, Paris (9, Avenue Percier), capital 1,200,000 fr.; La Société des Forces Motrices de l'Oisans, Paris (120, Avenue des Champs Elysées), to establish hydro-electric plants in the Department of Isère; La Société de l'Energie Electrique du Languedoc, Paris (156, Rue de l'Université); and La Société Secteur Electrique Moulins du Magnoac, Castelnau-Magnoac, Hautes Pyrenées.

New Uruguayan Duties on Radio Apparatus.

A *Reuter's Trade Service* message from Montevideo says that a Presidential decree modifies a previous decree imposing additional import duties on radio-electric apparatus and accessories and phonographic apparatus. The new import duty on radio apparatus is 46 per cent., plus a surtax of 14 per cent. of the official valuations, which range from 0.80 to 1.80 pesos per gross kg.

A Continental Glass Cartel.

The Times reports that the one employer in the Belgian glass-working industry whose opposition had prevented the formation of a glassware cartel has changed his mind and the cartel may be regarded as virtually in being. In Belgian industrial circles it is thought that this will be followed by the formation of an international glassware cartel.

New Rumanian Company.

Under the auspices of the Brown, Boveri Co., a company has just been formed in Galatz, with a capital of approximately £275,000 and the title La Société des Usines Communales, to undertake the supply of electricity and the running of electric tramways and motor-'buses in that city. The municipal authorities of Galatz are providing nearly half of the capital, in return for which they will take 3 per cent. of the gross receipts.

German Cable-makers' Organisations.

There are two syndicates in the German cable industry for high-pressure cables and low-pressure cables, respectively. The number of member firms is 22 in each case, and the syndicates were prolonged on April 1st, 1930, for four years. Apart from these two combinations, a community of interests was formed at the end of last year by a number of the medium-sized and small firms for the systematic promotion of export trade. It is stated that a tendency exists to bring about amalgamation so as to concentrate production, and that movements in this direction may be expected in the future.

Electric Clocks in Australia.

We have received from Mr. A. G. Jackson, managing director of the Synchronome Electrical Co., Ltd., 195, Elizabeth Street, Brisbane, Queensland, a pamphlet illustrating and describing the electric clock installation in the Brisbane City Hall. This includes a clock in the tower with four dials each 16 ft. in diameter, with quarter chimes; the hour bell weighs 4¼ tons. In addition to this there are 60 dials of various sizes in various parts of the building, all controlled by the same master clock.

Great Britain's Radio Exports.

The *Wireless and Gramophone Trader* publishes statistics of the exports and re-exports of radio apparatus from this country during the first half of the current year. From these it is seen that the total values were as follows:—Exports, £551,391 (against £610,357 in January-June, 1929); and re-exports £146,393 (against £20,978). The principal importing country was the Netherlands, whose share amounted to £65,720 (£79,222 in 1929). Australia, who was first in the 1929 period with £81,621, fell to second place with £64,637. Other leading customers were the Union of South Africa, £53,458 (against £21,912); Italy, £46,970 (£18,731); France, £40,881 (£24,795); Sweden, £23,954 (£10,627); Belgium, £23,270 (£20,589); and the Irish Free State, £21,209 (£26,201). The large increase in the re-exports was due to a phenomenal rise in the share of the Netherlands—from £2,648 to £118,227.

Lamp Manufacture in Australia.

An announcement by the Australian General Electric Co., Ltd., relating to the new lamp factory at Newcastle, New South Wales, recently appeared in the Sydney *Daily Guardian*. This stated that the factory was nearing completion and that negotiations were being conducted whereby it was expected that the factory would be acquired by the N.V. Philips Gloeilampenfabrieken, the British Thomson-Houston Co., Ltd., and the General Electric Co., Ltd. These three companies announced at the same time that they expected to complete arrangements in the near future for the formation of an Australian company to acquire the factory. "This amalgamation of interests will ensure a production adequate for requirements of the whole of the Australian market, and will at the same time give employment to a greater number of people."

The products of the new company, it was stated, would bear the trade names "Philips," "Mazda," "Osram," "Condor" and "Ediswan" and would be sold as before through the following Australian distributors and their agents:—Philips Lamps (Australia), Ltd. ("Phillips"); the Australian General Electric Co., Ltd. ("Mazda"); the British General Electric Co., Ltd. ("Osram"); Condor Lamps (Australia), Ltd. ("Condor"); and the Ediswan Electrical Co., Ltd. ("Ediswan").

The latest statistics of Australia's import trade—those for the fiscal year 1928-29—show that the imports of filament lamps in that period had a value of £664,000 apportioned as follows:—United Kingdom, £296,000; Holland, £252,000; United States, £51,000; Austria, £18,000; Hungary, £4,000; other countries, £43,000.

Industrial Group Life Insurance.

Messrs. David Brown & Sons (Huddersfield), Ltd., have recently adopted a group life insurance scheme for the benefit of their employés. For the purposes of the scheme (which has been arranged by the Metropolitan Life Insurance Co. of New York) the employés are grouped in five classes according to weekly earnings and the insured amount and the weekly contributions are based on this figure. The plan includes disability benefit and other advantages, and the cost above the employés' contributions is met wholly by Messrs. David Brown & Sons.

Industrial Welfare Conference.

The eleventh annual lecture conference of the Industrial Welfare Society is being held at Balliol College, Oxford, on September 5th. Sir Arnold Wilson is to deliver an opening address. The lecturers include Sir Joseph Burn, who will speak on "Pension Schemes"; Mr. R. Lloyd Roberts, chief labour officer of Imperial Chemical Industries, Ltd., on "Works Committees"; and Mr. A. P. Young, manager of the Rugby works of the British Thomson-Houston Co., Ltd., on "Industrial Developments and Human Needs." The present trend of bringing together industrial and cultural developments is illustrated by a lecture which will be given on "The Drama and Industry" by Miss Lena Ashwell.

New York Power Engineering Exhibition.

The *Board of Trade Journal* states that the ninth National Exposition of Power and Mechanical Engineering will be held in New York from December 1st to 6th. The exhibits will include the latest equipment for fuel combustion, power generation, distribution, transmission and utilisation, heating and ventilation, refrigeration, material handling, tools and machine tools and machine shop equipment, apparatus and instruments of precision. Over 500 exhibitors will participate—many of them operating their machinery.

German Electrical Imports and Exports.

According to the official returns just to hand, the imports of electrical machinery and apparatus into Germany during the six months ended with June last attained a value of £1,052,000, as compared with £1,255,350 in the corresponding period of 1929. On the other hand, the exports of similar material from Germany reached a total of £14,043,350, as compared with £13,445,500. The import total was made up of electrical machinery, £248,500, and parts, apparatus, and fittings to the extent of £803,500. The respective figures for the exports were £2,820,050 and £11,223,300.

Bankruptcy Proceedings.

F. M. Crane, trading as C. S. Mayfield & Co., 67, Carshalton Road, Carshalton, and as the Sutton Electrical Installation Company, 38, Brighton Road, Sutton, Surrey, electrician.—The public examination herein was held on August 13th at Croydon. The debtor stated that he traded with another at Carshalton, as electricians, each investing £150 in the business. In December, 1929, the partner retired, taking £75. The debtor then continued the business until May of this year and removed to Brighton Road, Surrey. The statement of affairs showed liabilities of £413 and a deficiency of £202. The debtor attributed his position to lack of capital, overhead charges and trade depression. The examination was adjourned for closing.

H. F. Spence, trading as H. F. Spence & Sons, 2, Eureka Terrace, Honiton, Devon, electrical engineer.—The public examination of this debtor was held recently at Exeter. The statement of affairs showed liabilities of £1,661 and assets of £447, leaving a deficiency of £1,214. The debtor attributed his failure to loss by depreciation of stock when he removed from a shop at Sidmouth in 1928; damage to stock of about £150 owing to a shed being blown down in last autumn's gale; prospective customers for the installation of country house lighting plant deciding to wait because of the Government's electricity scheme; keen competition in wireless goods; depreciation of assets and the illness of his daughter. The examination was adjourned.

W. A. Hollingworth, 3, Barton Terrace, Stanley Street, Hull, wireless and gramophone dealer.—The first meeting of creditors was held at the Official Receiver's office, 37, Scale Lane, Hull, on August 20th. The statement of affairs submitted showed liabilities of £440 and assets of £47, leaving a deficiency of £393. The debtor attributed his failure to bad trade. The matter was left in the hands of the Official Receiver as trustee.

J. H. Noble, 12, High Bridge, Newcastle-on-Tyne, electrical engineer and contractor.—The adjourned public examination of this debtor was formally closed when he appeared at the Court House, Newcastle-upon-Tyne, recently. His statement of affairs disclosed liabilities of £1,013 and no assets.

J. M. Walsh, electrical engineer, 33, Villiers Street, Strand, W.C.2.—Receiving order made August 14th on debtor's own petition. First meeting held on August 27th. Public examination, October 21st, at Bankruptcy Buildings, Carey Street, London, W.C.2.

O. H. Bradford, electrical and wireless engineer, 2a, Hill Street, Griffithstown, Mon.—Receiving order made August 15th on a creditor's petition.

H. A. Kaplan, wireless dealer, 89, Elgin Mansions, Elgin Avenue, W.9.—Trustee, Mr. S. G. Crimes, Premier House, 150, Southampton Row, London, W.C.1, appointed August 15th.

W. G. Conway (Listron), wireless component dealer, 88-90, Chancery Lane, London, W.C.—Last day for receiving proofs of dividend, September 9th. Trustee: Mr. C. Latham, 78, New Oxford Street, W.C.1.

G. F. A. Stone (Stone Manufacturing Co.), electrical accessories manufacturer, 108, Great Saffron Hill, E.C.—Last day for receiving proofs of dividend, September 8th. Trustee: Mr. F. Vyvyan, Bankruptcy Buildings, Carey Street, W.C.2.

A. E. Shapland, electrical engineer, Chippenham Cottage, Exmouth.—First and final dividend of 1s. in the £, payable August 29th at the Official Receiver's offices, Exeter Bank Chambers, 67, High Street, Exeter.

C. W. C. Oliver (A. G. Browne & Ideal Stores), wireless and gramophone dealer, 21, Netherlands Road, New Barnet, Herts.—Trustee, Mr. C. Latham, 78, New Oxford Street, W.C.1, appointed August 19th.

Company Liquidations.

FOUNDATION CO., LTD., York House, Regent Street, W.—The first meetings of the creditors and shareholders of this company were held in London on August 21st before Mr. J. Barwick Thompson, Official Receiver. A compulsory winding-up order was made on June 2nd upon a creditor's petition, and a statement of affairs has been lodged showing total liabilities of £602,487 (unsecured £343,613), and net assets of £54,397. The deficiency with regard to contributories is estimated at £714,216, the issued capital being £425,000. The chairman reported that the company was registered as a private company in 1922 with a nominal capital of £250,000, subsequently increased to £500,000, and was formed to acquire from the Foundation Co. of New York the goodwill and the company's business in the United Kingdom, the British Dominions (other than Canada), and all Colonies and Dependencies, including India. The company was converted into a public company in December, 1923. The consideration for the purchase was £100,000 in ordinary shares. Several important public works contracts had been carried out by the company. In 1922 a power station was erected at Lydney, Gloucestershire, for the West Gloucester Power Company, the contract price being £684,000. The next was with the Underground Railway for the completion of the extension of the tube from Hendon to Edgware, the price being £258,000. These were succeeded by a contract to build escalators at Moorgate Street Station, another for the construction of a tube extension of the City and South London Railway from Tooting to Morden at a cost of £700,000, and others from the London Electric Supply Corporation, Ltd., the Marconi Co., the North Wales Power Co., and various municipal councils. At the end of June, 1925, the uncompleted contracts amounted to £888,700, and in the following year the total value of orders received was approximately £1,250,000. The company next embarked upon development and housing schemes, and it also entered into a contract with the Punjaub Pulp & Paper Co., Ltd., to erect a mill. A balance of £169,982 was due to the company under that contract. Another contract was to construct an irrigation dam at Harsi for the State of Gwalior. A debenture action was taken by the "bearer" note holders, and on December 31st, 1929, Mr. J. H. Stephens was appointed receiver and manager of the company. The receiver anticipated that by the end of the current year he would realise sufficient to discharge the claims of the note holders, but he was unable to state what surplus would be available for the unsecured creditors and shareholders. The failure of the company was attributed to the inability of the Punjaub company to meet its obligations as they became due, and to the fact that the company was unable to obtain payment of very substantial sums under the Harsi contract. The chairman said that the company had made profits on the contracts in this country, but the losses sustained over the two Indian contracts amounted to over £200,000, but for which loss the assets would have been quite sufficient to pay every creditor 20s. in the £. Steps were being taken to reduce the indebtedness on the loan notes of £150,000. He understood that an application would be made to the Court very shortly for an order to pay a first dividend of 15s. in the £ on those notes. The statement of affairs filed under the liquidation disclosed the position as at December, 1929, when Mr. Stephens was appointed receiver. It would be appreciated that the position had altered somewhat since then, but Mr. Stephens was completing the contracts on hand. He had furnished a report, from which it appeared that upon his appointment the amount of the contracts to be carried out in Great Britain were estimated at £1,163,258. It was not possible at this stage to furnish any reliable figures as to the final outcome of his receivership, but he had paid into Court the sum of £100,000 and had £28,000 in hand. A resolution was passed for Mr. Russell Kettle (Deloitte, Plender, Griffiths & Co.), 5, London Wall Buildings, E.C., to act as liquidator, assisted by a committee of inspection, consisting of five principal creditors.

BOWYER-LOWE CO., LTD., Radio Works, Letchworth.—This company went into compulsory liquidation last April with total liabilities £22,759 (unsecured £17,784); net assets £9,159; and a deficiency of £13,824 with regard to contributories. Mr. H. P. Naunton, Official Receiver, reports that the company was incorporated in 1922, to acquire from Messrs. A. E. Bowyer-Lowe and H. W. Widgery the business of manufacturers of variable condensers carried on by them in partnership as "The Bowyer-Lowe Company" and to carry on the business of manufacturers of wireless apparatus. The business at first proved progressive, but Mr. Bowyer-Lowe states that subsequent to 1925 it decreased, and in June, 1928, he was asked whether the company could manufacture the "Recordaphone," an electrical instrument for the recording and subsequent reproduction of sound. In 1928, Recordaphones, Ltd., was incorporated with a capital of £200,000, and Mr. Bowyer-Lowe joined the board. In the following January, Recordaphones, Ltd., with a view to having the Bowyer-Lowe Company as its subsidiary for manufacturing purposes, acquired the shares of the latter company for £34,436 in cash (£18,436) and shares. Recordaphones, Ltd., did not succeed in obtaining a sufficient demand for "Recordaphones" to place manufacturing with the Bowyer-Lowe Company. Accordingly it was decided to finance the Bowyer-Lowe Company with a view to increasing the latter company's turnover in radio apparatus. By the middle of 1929, Recordaphones, Ltd., was no longer able to continue financing the Bowyer-Lowe Company and a debenture for £5,000 was issued to the bank. On February 25th, 1930, when £4,102 was due to the bank, the latter appointed Mr. R. Lawrence March as receiver; he closed down the factory and in the following month sold it for £6,600. Mr. Bowyer-Lowe considers that the price was inadequate. He attributes the failure of the company to the inability of Recordaphones, Ltd., to provide further finance; to keen competition; to over-production by larger companies; and to general trade depression. Mr. F. E. Bendall, C.A., has been appointed liquidator with a committee of inspection.

UNBREAKABLE LAMPS, LTD. — Winding up voluntarily. Particulars of claims to be sent to the liquidator, Mr. F. E. Bendall, 3, Warwick Passage, Corporation Street, Birmingham, by September 18th.

MERSEY RADIO & GRAMOPHONE CO., LTD.—Meetings of creditors and members are called for October 10th at 47, Mosley Street, Manchester, to hear an account of the winding up of the company by the liquidator, Mr. A. T. Eaves.

WITTY & WYATT (CARDIFF), LTD.—Particulars of claims to the liquidator, Mr. W. R. Gresty, 133-4, Bute Street, Cardiff, by September 20th.

MORRIS, RUSSELL & CO., LTD.—A general meeting will be held at Kennan's House, Crown Court, Cheapside, E.C.2, on September 23rd, to hear an account of the winding up of the company by the liquidator, Mr. D. Lewis.

Meetings of Creditors.

CHEAP ELECTRIC POWER CORPORATION, LTD.—A meeting of creditors was to be held on August 25th at Salisbury House, E.C.2.

HARRISON'S, LTD.—A meeting of creditors was to be held on August 27th at the office of Messrs. Martin & Stone, 1, Police Street, Manchester.

New Catalogues and Lists.

ELECTRIC RESISTANCE FURNACE CO., LTD., 17, Victoria Street, London, S.W.1.—The August issue of "The Resistance Furnace" describes the "Efco" carburising furnaces.

GENT & CO., LTD., Faraday Works, Leicester.—Book 5, Section 2e, dealing with the "Pul-syn-etic" system of electric turret clocks; also Book 7, Sections 5c and 7a, on staff locaters and power bells, respectively.

THE D.P. BATTERY CO., LTD., 50, Grosvenor Gardens, Victoria, S.W.1.—An instruction booklet for "Kathanode" traction cells.

SIEMENS BROTHERS & CO., LTD., Woolwich.—Pamphlet 155A containing 40 pages of information regarding e.h.p. cables.

GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—A schedule of Osram radio valves for the 1930-31 season.

BROOK MOTORS, LTD., Empress Works, Huddersfield.—A folder dealing with Brook motors and a list of machines for sale.

THE HARLAND ENGINEERING CO., LTD., B.E.P. Works, Alloa, Scotland.—Publication X50/3006, which illustrates the company's electrical and hydraulic products.

Messrs. HEYES & CO., LTD., Water-Heyes Electrical Works, Wigan.—The "Wigan Review" for August containing notes on the company's lighting fittings, &c., and particulars of new air-break flameproof switchgear.

ELECTRIC FIRES, LTD., Heatrae Works, Norwich.—A comprehensive catalogue (60 pp.) of the company's electric fires, small cookers, water heaters, and domestic appliances. Full details are given, with illustrations and prices.

Messrs. THOMPSON & CO., 1 and 3, Old Swan Lane, E.C.4.—An illustrated brochure dealing with "Rex" (Swiss) prepayment electricity meters for which the firm is sole British agent.

Messrs. A. REYROLLE & CO., LTD., Hebburn-on-Tyne.—An illustrated catalogue of "Castle" electric welding equipment made by Messrs. J. H. Holmes & Co., Ltd.

Trade Announcements.

Messrs. PARMITER, HOPE & SUGDEN, LTD., Longsight, Manchester, state that their telephone number has been altered to "Ardwick 1381 and 1382."

Messrs. W. E. BURNAND & CO., 66-106, Shoreham Street, Sheffield, have taken over the "Phœnix" electric lifting magnet business which was carried on until recently by Messrs. Steel, Peech & Tozer, Ltd. Messrs. Burnand have sent us some pamphlets illustrating and describing their works and products.

The AEROGRAPH CO., LTD., 43, Holborn Viaduct, E.C.1, asks us to state that it has no connection whatever with the Aerograph Spraying Co., of Sturt Street, Shepherdess Walk, London, against whom a bankruptcy petition has been filed. The Aerograph Co., Ltd., is the owner of the "Aerograph" registered trade mark.

The Brighton branch of CRYSELCO, LTD., is being removed to larger premises at 59, Ship Street. (Telephone: Brighton 5512; telegrams: "Cryselco, Brighton") on September 1st.

Messrs. E. R. MORTON, LTD., 22, Bartlett's Buildings, Holborn Circus, E.C.4, have been appointed London representatives for the electric heating and cooking appliances made by ELECTRICAL UTILITIES, LTD.

Recent Contracts.

The General Post Office has recently ordered from the D.P. BATTERY CO., LTD., seven new "Kathanode" batteries to replace some of similar type which have been used on trucks for conveying mails for the past three and a half years. The company has also received a repeat order for "Kathanode"

batteries from the Ilford U.D.C. The new batteries each consist of 40 cells having capacities of from 280 to 320 Ah and are to replace batteries of similar type which have been in service for about three and a half years.

Eleven ships now being built for the Anglo-Saxon Petroleum Co., Ltd., will be equipped by the Marconi International Marine Communication Co., Ltd., with valve transmitters known as the type M.C.13, which have a power of 1¼ kilowatts and operate on interrupted-continuous-waves over the waveband of 600 to 800 metres. The type 352 receivers are two-valve instruments with the exceptionally wide wave range of from 15 metres to 20,000 metres, and are entirely self-contained.

Messrs. John Bennie, Ltd., Glasgow, have secured a contract from the City of Bradford for 12 high-speed a.c. lifts, six of which are passenger lifts and six goods lifts. Another contract recently placed with the company is one from the Metropolitan Asylums Board for 13 hospital lifts fitted with self-levelling gear and constructed to prevent the harbouring of dust. The total value of these contracts is about £25,000.

For Sale.

The Colne Electricity Department has electrical plant for disposal, including dynamos, motors, pumps, boilers, a booster set and a cooling tower.

The West Central Merchandise Mart is to sell by auction on September 3rd at York House, Theobalds Road, W.C.1., the stock of an electrical and wireless factor now in liquidation. (See our advertisement pages to-day.)

Book Notices.

"Gewichtverlegung und Ausnutzung des Reibungsgewichtes bei Elektrischen Lokomotiven mit Einzelachsantrieb," by Dr.-Ing. H. G. Lindner. Pp. 25. Berlin: V.D.I.-Verlag. Price Rm. 5.—The attention of designers and builders of electric locomotives may be drawn to this little work by Dr.-Ing. H. C. Lindner on "The Weight Disposition and the Utilisation of the Adhesion Weight of Electric Locomotives with Single Axle Drive." The author deals with his subject in the usual German exhaustive manner, the text being accompanied by 32 illustrations.

"Die neuzeitliche Dampfturbine," by Prof. Dr.-Ing. E. A. Kraft. Pp. viii+214. Berlin: V.D.I.-Verlag. Price Rm. 20.

German Unemployment Relief Scheme.

In accordance with the Government programme to provide employment, the German Post Office has now given contracts to the value of £10,000,000 to various electrical, machinery and building firms, which have offered to provide the material and to carry out the work at prices averaging 10 per cent. below market prices. It is expected that work for 125,000 men will thus be provided by the Post Office. The cement and linoleum trusts were the only ones which refused to reduce their prices for the Post Office, but in the first case firms outside the trust made satisfactory tenders, and in the second case the Post Office will dispense with the use of linoleum in the new buildings which are to be constructed.—*Reuter* (Berlin).

Lamp Price Reductions.

On Monday next, September 1st, the prices of lamps made by members of the Electric Lamp Manufacturers' Association are to be reduced. From a list received from one of the E.L.M.A. companies it is seen that these reductions vary from 1d. to 2d. in the case of the lower-wattage lamps to as much as 6d. for the 100-W size.

The E.T.B.I. House Competition.

The competition closes on September 30th and all unsold books, cash collected, and solutions should be posted so as to reach the Secretary by the first post on October 1st.

Electrical Supplies for Jugo-Slavia.

The Commercial Secretary at the British Legation, Belgrade, has forwarded to the Department of Overseas Trade a report on the market in Jugo-Slavia for electrical contractors' supplies. A copy of the report can be obtained by firms interested in the supply of material of British manufacture on application to the Department, 35, Old Queen Street, S.W.1. (Reference No. A.X. 10057.)

Prices of Materials.

Messrs. Edward Till & Co. report, August 26th: India-rubber, Para fine: 6½d., ½d. increase.

Messrs. James & Shakespeare & F. Smith & Co. report, August 26th: No change in the price of copper.

Messrs. James & Shakespeare report, August 26th: English pig lead: £19 10s., 5s. decrease.

In their letter dated August 23rd, Messrs. James Forster and Co. stated that the lead market was extremely dull during last week, the total turnover having been smaller than for some time past. Values were practically unchanged on the week. Arrivals during this month have so far been small, and a temporary scarcity of spot lead has thereby been created. Several thousand tons which is due at the end of this week will more than satisfy the demand for early lead, whilst the 24,000 tons shipped from Australia in July will be arriving next month, and should be more than sufficient to fill the requirements of consumers here and on the Continent, unless there is a decided improvement in consumptive demand in the near future.

Lighting and Power Notes.

Australia.—Sydney.—The City Electricity Committee has decided to proceed with a scheme costing £2,175,000 for the changing-over of the system of electricity supply from d.c. to a.c.

Melbourne.—The State Electricity Commission of Victoria is to take over the undertaking of the Melbourne Electric Supply Co., Ltd., on September 1st.

Bethesda.—Wiring Scheme.—The Electricity Committee has had under consideration a scheme for the wiring of premises to encourage the use of electric cookers and heaters, and has decided, with the consent of the Council, to arrange a local exhibition of electrical appliances.

Carlisle.—Year's Working.—We have received from Mr. C. W. Salt, city electrical engineer, a copy of the report and statement of accounts of the Corporation Electricity Department for the year ended March 31st last. The total revenue increased from £89,542 to £96,091, while working expenses rose from £47,530 to £50,749. The gross profit amounted to £45,342 (£42,012), to which was added an unemployment grant of £6,377, making a total of £51,719 available. After deducting capital and other charges, there was a net surplus of £1,968, as compared with £4,798 in 1928-29, the decrease being mainly due to increased income tax on profits. Capital expenditure during the year amounted to £141,631, bringing the total now spent on the undertaking to £730,267. Electrical energy sold increased from 12,919,432 to 13,995,547 kWh and the maximum load from 6,600 to 7,200 kW. The average price obtained per kWh fell from 1.66d. to 1.65d., a reduction in tariffs having been made in January last.

Cheltenham.—Shop-window Lighting.—The Corporation Electricity Committee has adopted the following charge for the supply of energy to shops for flood-lighting and window lighting inside and outside the premises: £7 per kW of demand per annum, plus ¾d. per kWh consumed, the charge to be made quarterly as at present, but to be for a minimum period of twelve months.

New Transformers.—Application is being made by the Electricity Committee for sanction to a loan of £2,500 for the provision of transformers.

Supply to Housing Estate.—The Electricity Committee is asking the Housing Committee to consider the question of the supply of electricity to houses on the Whaddon Road housing estate.

Continental.—France.—According to *l'Industrie Electrique*, during the first three months of this year the maximum demand upon the Paris generating stations reached 312,000 kW, as compared with 299,000 kW in the same period of 1929. The energy produced amounted to 209 million kWh, as against 202 million kWh.

Switzerland.—A large barrage which is being built in the Aar Valley, close to the Col de Grimsel, will impound 100 million cu. m. of water, and will require 340,000 cu. m. of masonry. The generating station will work under a head of 540 m., and will have a capacity of 120,000 h.p., the power generated being transmitted to the cities of Berne and Bâle. The water supplied to this station will afterwards be diverted through a tunnel about 5 km. long to another station of 52,000 h.p. capacity.

Poland.—According to a return issued recently, the output of electric power stations in Poland amounted last year to a total of only 1,015 million kWh, as compared with 1,053 million kWh in 1928, a decrease of about 3.6 per cent.

Austria.—A Government commission has recently been appointed to inquire into the question of the nationalisation of the various hydro-electric undertakings in Austria. A proposal is under consideration to bring all the stations under one control and to form a company, in which the Austrian Government would hold the major portion of the capital, for the distribution of the power generated.

Coventry.—Loan.—The City Council has decided to apply for sanction to a loan of £4,625 for mains and switchgear.

Credition.—Transfer of Undertaking.—The Urban District Council has applied to the Electricity Commissioners for a Special Order authorising the transfer of the Crediton electricity undertaking to the Exe Valley Electricity Co., Ltd.

Gainsborough.—Loans.—The Urban District Council has applied for sanction to loans of £3,000 for mains and services and £300 for meters.

Glasgow.—Year's Working.—The report of the Corporation Electricity Department (general manager: Major H. Bell) for the year ended May 31st last shows a total revenue of £1,497,372, a working expenditure of £615,480 and a gross profit of £881,892. The previous year's figures were: Income, £1,515,933; working expenses, £573,158; gross profit, £682,965. From the gross profit had to be paid loan interest (£248,763) and loan redemption (£410,219), leaving a net surplus of £222,910, which has been transferred to the renewals and special expenditure account, as compared with £113,250 in 1928-29. The gross capital expenditure for the year amounted to £211,157, the total now spent on the undertaking standing at £10,472,372, of which £2,148,464 has been met out of revenue. Sales of electricity increased from 233,155,455 to

251,035,240 kWh and the maximum supply demanded from 295,187 to 312,822 kW. The average price obtained per kWh fell from 1.56d. to 1.42d. The number of consumers connected during the year amounted to 12,228, bringing the total to 96,302, while hire-purchase installations increased by 8,531, making a total of 23,086.

Progress during July.—Under the Corporation Electricity Department's scheme 277 houses were wired in July, making the total to date 24,538, while hired appliances numbered 20, bringing the total to 19,918.

Mains Extensions.—The Electricity Committee recommends the laying of mains at a cost of £5,410.

Greenock.—Extensions.—The Corporation Electricity Committee has approved the extension of h.p. and l.p. cables, with transformer house, switchgear, and transformer at an estimated cost of £5,557.

Japan.—Hydro-electric Power Station Completed.—A new hydro-electric power station has recently been completed at Soyama by the Showa Electric Power Co. The plant comprises three 20,000-kVA turbo-generators working under a head of about 219 ft.

Kent.—Assistance for Supply Scheme Refused.—An application to the Treasury by the Weald Electricity Supply Co., Ltd., for assistance in a scheme to supply electricity in nine rural districts and 39 parishes in Kent and East Sussex has been refused. The districts included Ticehurst, Uckfield, East Grinstead, Hailsham, Tonbridge, Maidstone, Hollingbourne, Cranbrook, and Tenterden. It is understood that the Electricity Commissioners reported adversely on the scheme because it was proposed to use underground cables instead of overhead lines. If the scheme were carried through, over 1,000 further houses would have a supply of electricity.

Leeds.—Progress of New Power Station.—It was hoped that the official opening of the Corporation's new generating station at Kirkstall would take place in October, but it has now been decided that work is not sufficiently advanced to justify the official inauguration until some time next spring. Certain parts of the plant will be actually working in October but the equipment as a whole is not as advanced as was anticipated. Work on the site was begun in July, 1928, and the excavations, steelwork and plant installation have provided work continuously for between 150 and 200 men for two years. The cost of the section first to be opened will be about £800,000, but with future extensions the total cost is estimated to be £2,250,000.

Liverpool.—Public Lighting.—The report of the city lighting engineer, Mr. P. J. Robinson, on the public lighting of the city for the year ended March 31st shows that the total length of roads lighted by electricity increased during the year from 174 to 186 miles and the number of electric lamps from 9,766 to 10,434. The gross expenditure of the City Lighting Department amounted to £122,690, and a revenue of £11,565 was obtained from work performed for and material supplied to other departments and committees, making the total net expenditure on public lighting £111,125. Mr. Robinson emphasises the need for a more scientific application of street lighting, especially with regard to the elimination of "glare," and refers to alterations that have been made in existing types of lanterns to render them more efficient. Experiments have also been carried out with "Radiovisor" automatic switches which have proved very satisfactory.

Oldham.—Year's Working.—A total revenue of £247,789, as compared with £238,658 in the preceding year, is shown in the accounts of the Corporation Electricity Department (engineer: Mr. F. L. Ogden) for the year ended March 25th last. Working expenses amounted to £142,369, as against £117,542. the gross profit declining from £121,116 to £105,421. To the gross profit was added the balance from the previous year's account (£26,618), an unemployment grant (£7,518), income tax deducted from interest on loans (£12,181), interest on investments (£4,730) and a profit of £196 from the sale of fittings. This made a total of £156,663 available which was distributed as follows:—Reserve fund, £26,618; sinking fund contributions, £43,137; interest on loans, £60,902; other items, £25,136. There remained a net surplus of £864, as compared with £21,618 in the preceding year. During the year the expenditure on capital account was £150,060, the chief items being £46,006 for street mains and £32,712 for tie and interconnecting mains. The total now spent on the undertaking is £1,893,350. The sales of electricity increased from 48,523,688 to 52,549,764 kWh and the maximum load from 25,600 to 28,600 kW. The acute depression prevailing throughout the year in the staple industries of the town has reduced the load on the undertaking for power purposes by from eight to ten thousand kW.

Perth.—Price Reduction.—The Town Council has decided to reduce the tariffs for electricity by ¼d. per kWh for lighting and by 20 per cent. for power.

Sheffield.—Year's Working.—We have received from Mr. Ernest Morgan, general manager of the Corporation Electricity Department, a copy of the annual report and statement of accounts of the undertaking for the twelve months ended March 31st last. An increase from £850,190 to £884,174 is shown in the total revenue, working expenses rising from £385,111 to £440,654. To the gross profit of £443,520 (£465,079) was added income from other sources making a total of £451,302, from which the following sums had to be met:—Income tax, £44,491; interest on loans, £144,213; and sinking fund contributions, £173,740. There remained a net surplus of £88,854, as compared with £114,473 in the preceding year. The net capital expenditure during the year was £305,172, the chief item being £261,674 for mains, services, substation equipment, &c. The total spent on the undertaking now stands at £5,678,359. The sales of electrical energy increased from 208,843,221 to 223,934,191 kWh and the maximum demand (including 10,650 kVA from Rotherham) from 92,196 to 95,384 kVA. The average price obtained per kWh fell from 0.964d. to 0.935d., a reduction in tariffs, which brought the charges down to the pre-war level, having resulted in a saving to consumers estimated at approximately £70,000 for the year under review.

Skegness.—Electricity Supply.—Mr. R. Borlase Matthews, to whom the Electricity Commissioners have granted an Order in respect of electricity supply in Lincolnshire, has selected Skegness as the initial area of his operations pending official sanction to the complete scheme. The Central Electricity Board has granted him a supply at Boston, which is the nearest large town, and Mr. Matthews has, therefore, been placed in a position to enter into negotiations for carrying the supply by overhead lines to Skegness. The area to be dealt with will comprise the main parts of Skegness, 400 houses and other buildings being included in the first section of the works.

Skipton.—Extensions.—The Urban District Council has approved an extension scheme to the Broughton Road district by overhead line from the Keighley Road sub-station at a cost of £1,790. Application is being made for sanction to a loan and also to the Unemployment Grants Committee for a grant.

South Africa.—Electricity Commission's Annual Report.—Since the establishment of the Electricity Supply Commission in South Africa, five schemes have been put into operation—at Natal Central, Witbank, Cape Town, Durban and Sabie. The annual report issued recently shows that at December 31st last the capital expenditure was £7,655,040. The total revenue for 1929 amounted to £985,152, production costs being £990,270. The deficiency is attributed to the fact that these figures include the Durban and Cape Town undertakings before they had begun to operate commercially. The capacity of the main generating stations was 207,350 kW and the sales were 796,998,351 kWh, an increase of 169,086,056 kWh over 1928. The average cost per kWh sold was 0.298d.

South Shields.—Mains Extensions.—The Corporation Electricity Committee has asked the electrical engineer to submit an estimate of the cost of carrying out an extension of mains in the Simonside and East Jarrow districts.

Loans.—The Committee is applying for sanction to the borrowing of a further £10,000 for services and £5,000 for installations.

Stirling.—Year's Working.—The net profit on the Corporation electricity undertaking for the past year amounted to £545, which has been carried to reserve.

Stretford.—Year's Working.—The accounts of the Stretford and District Electricity Board (engineer: Mr. T. A. Kerr) for the year ended March 31st last show a total revenue of £227,291. Working expenses totalled £156,097 and there was a net profit of £71,194, to which was added £231 from rents and £2,215 interest on reserve fund investments, making a total of £73,640 available. After deducting loan charges (£62,790), bank interest (£2,687), income tax (£1,651), and contribution to reserve fund (£2,215), there was a net surplus of £4,297. The expenditure on capital account amounted during the year to £186,612, of which the principal items were £29,130 for main transmission lines, £51,653 for plant and machinery, and £88,090 for distribution mains and services. The total capital expenditure now stands at £850,959. The electrical energy sold amounted to 67,766,495 kWh and the maximum supply demanded was 21,110 kW. The assisted wiring scheme has been well supported, 1,005 consumers having taken advantage of it.

United States.—Rebuilding of Connors Creek Power Plant.—Preliminary work in connection with rebuilding the Connors Creek power plant of the Detroit Edison Company has been started. *Power* states that the tentative programme includes the construction of a new switch house, an addition to the present turbine room to accommodate two 60,000-kW tandem turbo-generators, and the ultimate replacement of all present boilers and turbines. Plans are still in the formative stage, but the ultimate rebuilt plant, including the additions, will probably contain fourteen new boilers, six 60,000-kW turbo-generators, and four 4,000-kW house-service units. This will double the rated capacity of the present plant. The entire project will cost approximately $30,000,000 and will require seven or eight years to complete.

Transmission Line Construction.—Construction of a 70-mile h.p. transmission line, connecting the Akron system of the newly-organised Ohio Edison Company with the $21,000,000 Toronto, Ohio, power development on the Ohio River, is to be started at once. The project will cost $3,000,000 and will include the erection of a sub-station costing $750,000.

Worksop.—EXTENSION ORDER APPROVED.—The Worksop Extension Order, which empowers the Urban District Council to supply electricity to a number of villages in Derbyshire, has been officially approved.

York.—LOANS SANCTIONED.—The Corporation Electricity Committee has obtained sanction to the following loans:—£4,000 for house-wiring installations for hire-purchase; £12,000 for domestic apparatus for hire; and £25,731 for boiler house plant.

Tramway and Railway Notes.

Blackpool.—TRAMWAY EXTENSIONS.—The Town Council is to apply for sanction to a loan of £8,383 in connection with the linking up of the Corporation's tramway system with that of the Lytham St. Anne's Corporation in Lytham Road.

Continental.—AUSTRIA.—With regard to a proposal to electrify the railway between Vienna and Graz, *The Times* states that a plan has now been put forward which, if adopted, would involve the ultimate abandonment of the present route over the Semmering (2,700 ft.) in favour of a tunnel, 7½ km. long, though the Semmering *massif*. To traverse the 14 km. as the crow flies, between the stations of Gloggnitz and Muerzzuschlag the railway to-day has to cover 80 km.

ITALY.—The extension of the Turin tramway services is planned as a scheme for the relief of unemployment during the winter.

GERMANY.—With the object of assisting in relieving the present unemployment in Germany, a proposal is now under consideration to put in hand the work of electrifying the railway between Weinheim, Mannheim, Heidelberg, Carlsruhe and Freiburg. At the last-mentioned town the line connects up with the Swiss railway system.

Croydon.—YEAR'S WORKING.—An increase from £122,779 to £127,035 was shown in the revenue of the Corporation Tramways Department for the year ended March 31st last. The total revenue expenditure, however, declined from £116,533 to £111,442, leaving a gross profit of £15,593, as compared with £6,246 in the preceding year. After providing for loan interest (£18,943), sinking fund contributions (£13,368), loan instalments (£6,342) and suspense account (£1,267) there was a net deficiency of £24,327, as compared with £32,078 in 1928-29. The number of passengers carried increased from 19,570,164 to 20,605,564 and the car-miles run from 2,283,608 to 2,312,360. The average revenue per car-mile was 13.04d., as against 12.75d. in the previous year.

Ilford.—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking (engineer and manager: Mr. L. E. Harvey) for the twelve months ended March 31st last show a gross income of £82,243, a working expenditure of £58,009, and a gross profit of £24,234. After providing for capital and other charges, there was a net surplus of £8,840, which, in spite of large increase sin income tax and rates, is greater by £166 than any previous surplus recorded.

Leeds.—NEW TRAMCARS.—The Corporation Tramways Committee is applying for sanction to the borrowing of £250,700 for the provision of 100 new tramcars.

Maidstone.—TRAMWAY ABANDONMENT.—*Modern Transport* states that the Maidstone and District Motor Services, Ltd., has acquired a controlling interest in the Chatham and District Traction Company, formerly the Chatham and District Light Railway Company. The tramways are to be replaced by a motor-omnibus service as soon as practicable.

Oldham.—RELAYING OF TRACK.—The Corporation Tramways Committee is to apply for sanction to a loan of £9,893 for the relaying of the tramway track in the Market Place.

Preston.—YEAR'S WORKING.—We have received from Mr. H. Clayton, general manager of the Corporation Tramways Department, a copy of his report together with a statement of accounts of the undertaking for the year ended March 31st last. The total revenue increased from £88,381 to £89,234, while the working expenditure amounted to £70,048, as compared with £66,768 in the preceding year. There was a gross profit of £19,186 (£21,613) and after making provision for loan interest (£2,289), income tax (£2,491), sinking funds (£9,240), revenue contributions to capital (£1,456) and sundry other items, there remained a net surplus of £3,575, as against £6,478 in 1928-29. The number of passengers carried increased from 15,799,963 to 15,885,844 and the car mileage from 1,188,393 to 1,207,723. The total revenue per car mile fell from 17.849d. to 17.732d.

Telegraph and Telephone Notes.

Egypt.—AUTOMATIC TELEPHONY.—The opening of a 1,000-line Strowger automatic exchange at Mansoura provided the most modern system of communication for the capital of the province of Dakahlia, in Lower Egypt, an industrial centre boasting several cotton-spinning, cotton, linen, and sail-cloth factories. The Egyptian State Telegraphs and Telephones Administration commissioned the Automatic Telephone Manufacturing Co., Ltd., to manufacture and install the plant, which is four-digit and comprises 900 individual subscribers' and 100 p.b.x. lines. All outgoing automatic traffic is handled *via* the trunk positions of a manual switchboard, and all traffic incoming passes through the same channel, the trunk operators at the manual board dialling the required numbers over incoming, second and final selectors. The p.b.x. facilities provided are for subscribers with groups of exchange lines up to a maximum of ten, and are given by 10-level, 10-contact, rotary final selectors mounted on the p.b.x. lineswitch unit. Should night service be required on a private branch exchange which is unattended, any line in the group except the first or common line may be allocated to this service, and connection established by dialling the corresponding number. In such event no hunting will take place, but the call will go through in the usual way. Provision has been made for recording any overflow that may occur on the groups of switches at any time, a highly desirable facility, as, in the event of any abnormal traffic, the number of switches in service can be adjusted as required. Three groups of meters are installed for this service. The power plant comprises a motor-generator set of Crompton-Parkinson manufacture, giving a total output of 80 amperes at 57 volts. As a stand-by a "Pelapone" oil-engine-driven generating set has also been installed. The main storage batteries are of the Alton Battery Co.'s manufacture, and the Crompton-Parkinson ringing machines are in duplicate. Every contingency has been provided for, failure of the telephone service through lack of current to operate the exchange being virtually impossible. The entire installation, with the exceptions referred to above, was manufactured at Liverpool, and the A.T.M. Company also supplied the whole of the subscribers' telephones for service in the Mansoura area and favourable comment has been made by the Administration upon the smooth and silent action of the type-24 dial with which they are equipped.

Mongolia.—IMPROVEMENT OF COMMUNICATIONS.—The Mongolian and Tibetan Affairs Committee has formulated a programme for improving communications in Mongolia for submission to the forthcoming Mongolian and Tibetan Affairs Conference. The project provides for the erection of radio broadcasting stations and the installation of long-distance telephone services.

Persia.—WIRELESS COMMUNICATION.—It is stated that negotiations are in progress between Persia and Italy, France, Germany, the United States, and other countries, with a view to the establishment of regular wireless-telegraph communication between them and Persia.—*Reuter* (Teheran).

Venezuela.—TELEPHONY FUSION.—Some time ago a telephone franchise covering the whole of Venezuela was granted by the Government to important nationals for a period of 30 years. It was later transferred to a local company, the Compania Anonima Nacional Telefonos de Venezuela, which concern is to be amalgamated with the Venezuela Telephone and Electrical Appliances Company, which operates in Caracas, La Guayra, Valencia, and Puerto Cabello.

Radio Notes.

Jugo-Slavia.—RADIO INTERFERENCE.—By one of the clauses of the Government's new penal code whoever, voluntarily or negligently, prevents, or interferes with, the functioning of a radio installation by means of electrical installations, or who "interferes with, or misappropriates, the current" necessary to the working of a radio installation is made liable to punishment by one year's imprisonment, or a fine of 10,000 dinars (approximately £394).

North Regional Station.—WAVELENGTHS.—The construction of the northern regional station buildings and the erection of its aerial masts are well advanced and test transmissions may be expected in October. The Moorside Edge, Slaithwaite, station's masts will be taller, and its service area larger, than those of the London station. Its wavelengths will be 479.2 metres (at present used by the midland regional 5GB station, which will then use Manchester's present wavelength of 377 m.) and 301.5 metres (at present used by the Aberdeen station, which will use the common 288.5-m. wave).

Rumania.—LICENCES.—Registered receiving sets, which number about 40,000, are estimated to be less than half the

total number in use. Accordingly the Post, Telegraph and Telephone Administration has decided, says *World-Radio*, to reduce the tax on all private sets to 300 lei (7s. 6d.) per year, and the initial subscription fee to 100 lei (2s. 6d.).

United States.—HOTEL INSTALLATION.—A new hotel now under construction in New York will have what is claimed to be one of the world's largest wireless reception installations. Some 190 miles of wire will supply a choice of six wireless programmes to each of the 2,000 rooms.—*Reuter* (New York).

Uruguay.—NEW LAW.—Theatres and concert halls are now legally compelled to allow their performances to be broadcast, says the *Wireless World*, according to the new radio statute. Apparently theatre managers who refuse facilities will be fined 100 pesos (£20) for each offence. The radio administration will be supported by listeners' licence fees, the annual contribution being about £2. Revenue will also be drawn from radio import duties.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Argentina.—BUENOS AIRES.—September 30th. National Sanitation Works Department. Four electric centrifugal pumping sets direct coupled to 3-phase motors, 220 V, 50 cycles; twelve electric pumping sets (deep well type); seven 3-phase oil-immersed transformers; 4,000 metres of underground cables, &c. (A.X. 10035.)*

Ashbourne.—September 20th. Urban District Council. A transformer kiosk and equipment; also e.h.p. and l.p. cables and roadwork. (August 22nd.)

Australia.—MELBOURNE.—Posts and Telegraphs Department. September 30th. Switchboard, instruments, and test plugs and sleeves. (A.X. 9937.)*
Transmitters and associated parts. (A.X. 10077.)*
October 14th. Condensers. (A.X. 10000.)*
BRISBANE.—September 29th. City Electric Light Co., Ltd. 550-kVA, 5,000 to 415-240-V outdoor-type transformers. Specifications (£2 2s. first copy, 10s. 6d. each additional copy) from J. T. Ryan, secretary to the company, Boundary Street, Brisbane. (A.X. 10043.)*
SYDNEY.—September 8th. Municipal Council. Automatic reclosing equipment for h.p. feeder switches. Specifications from the construction engineer, Electricity Department (deposit £1). Tenders to W. G. Layton, town clerk.
September 15th. H.p. pilot cables. (A.X. 10079.)*
September 29th. 33,000-V cable. (A.X. 10078.)*

Bury.—September 3rd. Electricity Department. 6,600-V 3-phase ironclad switchgear. (August 15th.)

Cardiff.—September 8th. Electricity Department. Electric locomotive. (August 22nd.)

Cheadle and Gatley.—September 5th. Electricity Department. 6,600-V switch unit and ring main insulators. (August 15th.)

Ealing.—September 8th. Electricity Supply Department. 33,000-V 3-phase main, transformers, automatic induction regulators, and switchgear. (August 15th.)

Edinburgh.—August 30th. Corporation. Heating plant at new school, Prestonfield, and electric lighting installation at new Craighall School. Schedules from E. J. MacRae, city architect. Tenders to town clerk.
September 4th. Electricity Department. Various works at a new transformer house. Schedules from the city architect; tenders to town clerk.

Egypt.—CAIRO.—Ministry of the Interior. September 30th. Electric motors, pumps, &c., at the Dessouk waterworks. (A.X. 9935.)*
Egyptian State Railways.—October 2nd. 100-ton electrically-driven shallow-type locomotive traverser.

Holywood.—September 1st. Electricity Department. L.p. overhead lines and underground cables, a transformer kiosk and a transformer. (August 15th.)

Hull.—September 18th. Electricity Department. Cooling tower pump and accessories. (August 8th.)
Corporation Telephone Committee. Private automatic telephone switchboard. (August 8th.)

India.—Indian Store Department. September 29th. Supply of 75-kW oil engine generating sets, &c., for Landikotal power station. (A.X. 10040.)*
September 4th. Transformers, switchgear and cable work. (A.X. 10095.)*

London.—LONDON COUNTY COUNCIL.—September 15th. Water-tube boilers with stokers, superheaters, economisers, ash conveying plant, switchgear, &c. (August 15th.)
September 15th. Wiring and fittings at the Whitechapel Fire Station. (August 22nd.)
BETHNAL GREEN.—September 1st. Borough Council. Electric lighting installation work at several blocks of tenement dwellings. (August 8th.)
CENTRAL ELECTRICITY BOARD.—October 6th. 66,000-V and 33,000-V overhead transmission lines for the North-East England Electricity Scheme. (See this issue.)
OFFICE OF WORKS.—September 9th. Electric bells, buzzers, bell pushes, &c. (See this issue.)

Marlborough.—September 25th. Electricity Department. Extension of 11-kV, 3-phase overhead lines to Savernake Hospital. (August 22nd.)

Newbury.—September 1st. Corporation. Two electrically-driven bore-hole pumps, together with boosters, switchgear, transformers, &c. (August 8th.)

Newcastle-upon-Tyne.—October 10th. Newcastle-upon-Tyne Electric Supply Co., Ltd. Steel frame buildings for power station; also 120-ton and 25-ton overhead electric travelling cranes. (See this issue.)

New Zealand.—WELLINGTON.—November 18th. Public Works Department. 110,000-V switchgear and steelwork for Waitaki power scheme. (A.X. 10022.)*
September 10th. Post and Telegraph Department. Dry cells. (A.X. 10093.)*
September 18th. Ebonite earpieces. (A.X. 10096.)*
DUNEDIN.—September 3rd. Corporation. Distribution transformers. (A.X. 10094.)*

Oldham.—September 19th. Public Assistance Committee. Electric lamps and fittings. Tenders to J. J. Williams, town clerk.

Paisley.—September 1st. Corporation. Electric lighting installations in 180 houses. Schedules from Master of Works, 16, Gilmour Street; tenders to the town clerk.

Rochdale.—September 1st. Town Council. Electric lighting and power installations in 216 houses, Clover Hall and Nook estates. Particulars from Borough Surveyor, Town Hall.

South Africa.—JOHANNESBURG.—September 29th. Railways and Harbours Administration. Two 4-ton electric portal cranes. (A.X. 10041.)*
September 20th. City Council. H.p. and l.p. insulators and shackles. (A.X. 10124.)*
H.p. and l.p. cables. (A.X. 10125.)*
Oil switches. (A.X. 10126.)*

Staffordshire.—September 27th. Education Committee. Installation of electric lighting at new Rookery Lane senior mixed school, Pensnett, near Dudley. (See this issue.)

Turkey.—ANKARA (ANGORA).—September 16th. Posts, Telegraphs, and Telephones Department. Telegraph wire. (A.X. 10075.)*

Turton.—September 15th. Electricity Department. E.h.p. overhead and underground mains, switchgear, kiosks, &c. (August 15th.)

Warrington.—September 1st. Electricity Department. Twelve months' supply of e.h.p. and l.p. cables, earthenware conduits, concrete slabs and tiles. (August 15th.)

Wrexham.—Electricity Committee. Wiring of 173 houses, Holt Road site. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.

Contracts Closed.

Australia.—New South Wales.—Public Works Department. Accepted :—
Pumping plant for south-west tablelands water supply (£9,117), and for Muswellbrook water supply £1,323).—Thompson's Engineering & Pipe Co.
Education Department.—
Sub-station in connection with the Tamworth-Werris Creek transmission line £535).—Metropolitan-Vickers Electrical Co., Ltd.
—*Tenders.*

Birkenhead.—Public Assistance Committee. Accepted :—
X-ray apparatus (£334).—Alexander & Fowler.

Glasgow.—Municipal Transport Committee. Accepted :—
Battery for Dalmuir sub-station.—Edison Swan Electric Co , Ltd.
Three transformer cases for sub-stations.—Brush Electric Engineering Co., Ltd.
Housing Committee. Recommended :—
Electrical installations in 84 houses at Quarrybrae (£323), and at 288 houses at M'Nair Street (£1,162).—R. J. Sinclair (Glasgow), Ltd.
Finance Committee. Accepted :—
Shop-window lighting at 254-290, Sauchiehall Street (£619).—Alex. Lindsay.
Education Committee. Accepted :—
Electric clocks, bells, &c., at Hyndland Secondary School (£104).—Edward & Sons, Ltd.
Electric lighting installation at Hillhead High School (£883).—Alex. Robertson.
Electricity Committee. Recommended :—
Three rotary convertors reconstructed (£2,820).—British Thomson-Houston Co., Ltd.
Two rotary convertors reconstructed (£1,988).—Metropolitan-Vickers Electrical Co., Ltd.
Two rotary convertors reconstructed (£1,505), and four new rotary convertors (£7,045).—Electric Construction Co., Ltd.
One motor convertor reconstructed (£2,233).—Bruce Peebles & Co., Ltd.
Corporation Sub-Committee on Properties. Accepted :—
Electrical installation at Hillhead Public Halls (£164).—T. B. & J. A. Matheson.

Government Contracts.—The following contracts were placed by various Government Departments during July :—

Admiralty, Contract & Purchase Department.
Electric cable.—Croydon Cable Works, Ltd.
Electric capstans.—Cowans, Sheldon & Co., Ltd.; Fullerton, Hodgart & Barclay, Ltd.
Electric travelling crane.—Marshall, Fleming & Co., Ltd.
Electric lighting and lightning conductor installation work.—G. E. Taylor & Co.
Electric welding plants.—Mawdsleys, Ltd.
Door switches.—Edison Swan Electric Co., Ltd.
W/t valves.—General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.
Electric winches.—Stothert & Pitt, Ltd.

War Office.
Submarine cable.—Siemens Bros. & Co., Ltd.
Searchlight lamps.—Park Royal Engineering Co., Ltd.

Air Ministry.
Ammeters and milliammeters.—Everett, Edgcumbe & Co., Ltd.
Replating battery at Farnborough.—Tudor Accumulator Co., Ltd.
Generator controls.—Pyne Manufacturing Co., Ltd.
Revolution indicators.—Record Electric Co., Ltd.
Mobile crane.—Ransomes & Rapier, Ltd.
Telephone receivers.—Telephone Manufacturing Co., Ltd.
Dimmer switches.—D. H. Bonnella & Son.
W/t valves.—Edison Swan Electric Co., Ltd.

Crown Agents for the Colonies.
Cables.—Standard Telephones & Cables, Ltd.
Cranes.—Babcock & Wilcox, Ltd.; T. Smith & Sons (Rodley), Ltd.; Stothert & Pitt, Ltd.; Vaughan Crane Co., Ltd.
Electric meter spares.—Ferranti, Ltd.
Generating plant.—Ruston & Hornsby, Ltd.
Lightning arrestors.—Siemens Bros. & Co., Ltd.
Replacements for power station.—Metropolitan-Vickers Electrical Export Co., Ltd.
Signalling materials.—Westinghouse Brake & Saxby Signal Co., Ltd.
Street lighting fittings.—Revo Electric Co., Ltd.
Sub-station structures.—Callender's Cable & Construction Co., Ltd.
Telephone apparatus.—Ericsson Telephones, Ltd.; General Electric Co., Ltd.
Train-lighting equipment.—J. Stone & Co., Ltd.
Wireless materials.—Marconi's Wireless Telegraph Co., Ltd.

Post Office.
Telephonic apparatus.—Automatic Telephone Manufacturing Co., Ltd.; Ericsson Telephones, Ltd.; General Electric Co., Ltd.; Siemens Bros. & Co., Ltd.
Testing and protective apparatus.—Phœnix Telephone and Electric Works, Ltd.; Power Equipment Co., Ltd.; Standard Telephones & Cables, Ltd.
Terminal blocks.—Thomas de la Rue & Co., Ltd.
Cable.—British Insulated Cables, Ltd.; Connollys (Blackley), Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.
Vacuum cleaners.—British Vacuum Cleaner & Engineering Co., Ltd.
Loading coils.—Siemens Bros. & Co., Ltd.
Telephone cords.—British Insulated Cables, Ltd.; L.P.S. Electrical Co., Ltd.
Electric lighting fittings.—General Electric Co., Ltd.
Galvanometers.—Walters Electrical Manufacturing Co., Ltd.
Generating set.—William Beardmore & Co., Ltd.
Bronze wire.—Frederick Smith & Co.
Manufacture, supply, drawing-in and jointing of cable.—Siemens Bros. & Co., Ltd.
Electric lifts.—Hastings P.O. & Telephone Exchange.—R. J. Shaw & Co., Ltd.
Short-wave telephony distribution switchboards at Rugby radio station.—Ferguson, Pailin, Ltd.
Short-wave radio-telephony receiver at Baldock radio station.—Standard Telephones & Cables, Ltd.
Accumulators, switchgear and cabling at Baldock radio station.—Drake & Gorham, Ltd.
Telephonic repeater station power plant at Aberdeen.—Haslam & Newton, Ltd.
Telephone exchange equipment.—Perivale (London, W.).—Siemens Bros. & Co., Ltd. Reliance (Tandem).—General Electric Co., Ltd.; sub-contractors: English Electric Co., Ltd., for charging machines; Crompton Parkinson, Ltd., for ringing machines, and the Chloride Electrical Storage Co., Ltd., for batteries. Colinton (Edinburgh multi-exchange area).—Siemens Bros. & Co., Ltd.; sub-contractor: Small Electric Motors, Ltd., for dynamotor. Prospect (Mortlake).—General Electric Co., Ltd.; sub-contractors: Crompton Parkinson, Ltd., for motor-generators and ringing machines, and D.P. Battery Co., Ltd., for batteries. Ewell (Surrey).—Automatic Telephone Manufacturing Co., Ltd.; sub-contractors: Electrical Construction Co., Ltd., for motor-generators and ringing machines, and Alton Battery Co., Ltd., for batteries. St. Helens (Lancs.).—Ericsson Telephones, Ltd.; sub-contractors: Electrical Construction Co., Ltd., for motor-generators and ringing machines, and Chloride Electrical Storage Co., Ltd., for batteries. Bedford.—Standard Telephones & Cables, Ltd. Liberton (Edinburgh multi-exchange area), Eccles, Portslade (Brighton multi-exchange area).—Siemens Bros. and Co., Ltd. Prescot (St. Helens multi-exchange area).—Ericsson Telephones, Ltd.

Office of Works.
Alternator set at Belfast Houses of Parliament.—Blackstone & Co., Ltd.
Switchboard erection.—T. Clarke & Co., Ltd.
Wiring of Broadmoor Asylum.—F. Troy & Co., Ltd.
Alterations to lifts, India Office.—Etchells, Congdon and Muir, Ltd.
Wiring at Windsor Castle.—J. Briggs, Electrical Contractors, Ltd.
Fittings, &c.—Siemens Electric Lamps & Supplies, Ltd.
Fuseboard, switches, &c.—Berry's Electric (1928), Ltd.; Revo Electric Co., Ltd.

Leeds.—Public Assistance Committee. Accepted :—
Reconstructing electric lift at St. James' Hospital (£180).—Messrs. George Porteus & Sons (Leeds), Ltd.
Electric lamps (£160).—Nox Electric Lamp Co., Ltd.

Manchester.—Health Committee. Accepted :—
Electric lighting work at Abergele sanatorium.—R. H. Clampnett & Co.
Education Committee. Accepted :—
Electrical installation at Openshaw technical school.—Sudlow & Co.

South Africa.—Cape Town.—Electricity Committee. Recommended :—
Electric lamps (£887).—G. L. Kustner.
Switchgear (£7,600).—A. Reyrolle & Co., Ltd.
L.p. cable (£7,354).—A. Vaux, Ltd.
Seven 100-kVA single-phase transformers (£675).—English Electric Co., Ltd.

Forthcoming Events.

British Association.—Bristol. September 3rd to 10th. Annual meeting.

Union Internationale des Producteurs et Distributeurs d'Energie Electrique.—Brussels, September 4th to 14th. Third biennial congress.

Association of Public Lighting Engineers.—Leicester. September 8th to 11th. Annual meeting and conference.

Institute of Metals.—Southampton. September 9th to 12th. Autumn meeting.

Iron and Steel Institute.—Prague, Czecho-Slovakia. September 15th to 20th. Autumn meeting.

Second British Glass Convention.—Buxton. September 17th to 20th.

Women's Engineering Society.—Oxford. September 19th to 21st. Eighth annual conference.

National Radio Exhibition.—Olympia. September 19th to 27th.

Municipal Tramways and Transport Association (Inc.).—Harrogate. September 24th to 26th. Annual conference.

British Science Guild.—Liverpool. October 22nd. Lecture by Lt.-Col. Sir David Prain on "Science Discipline." London. November 13th. Annual Norman Lockyer lecture by Prof. Sir William Pope.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following devices:—

A special warning plate attached to ordinary tumbler switches and marked Terry's Pat. 29526/13.

"SUCTO" vacuum cleaner.

Notes.

Flueless Rooms and Gas Fires.

In our last issue we summarised a letter by Lt.-Col. W. A. Vignoles, director, E.D.A., to *The Times*, in which he pointed out that electricity offers the only known method of producing light and heat without using up oxygen from the air.

Dr. Leonard Hill has replied that there is no advantage in the fact that an electric fire does not use up oxygen from the air. The difference of temperature between the air inside an ordinary room and that outside sets up ventilation through crevices of doors and windows sufficient to prevent any reduction of oxygen or accumulation of carbonic acid to the amount which is of consequence to health. A fire fitted with a flue occasions an increase of ventilation by drawing in outside air, and so makes the conditions better. We need abundance of cool and gently moving air to prevent body-heat stagnation and keep the respiratory membrance in good condition, and to sweep out of the room house-dust particles and microbes floating in the air. In cities, where windows cannot be opened with advantage, artificial ventilation of filtered outside air by fans is required, and this combined with the very gentle heating of ceilings or walls by pipes embedded in panels affords comfortable and healthy conditions, extra heating being obtained where required by a properly flued gas fire or an electric fire.

Dr. Leonard Hill concludes by suggesting that the electrical and gas trades should together seek to secure the best conditions for the homes of the less well-to-do at least cost, while bearing in mind the need for prevention of smoke pollution.

Educational.

HACKNEY TECHNICAL INSTITITE, Dalston Lane, E.8.—Evening classes in all branches of electrical engineering will re-open on September 22nd; enrolment will take place during the preceding week. Full particulars may be obtained on application to the Institute.

NORTHAMPTON POLYTECHNIC INSTITUTE, St. John Street, E.C.1.—Enrolment begins on September 15th for evening classes in all branches of civil, mechanical, electrical, aeronautical, automobile, and radio engineering, and also in applied chemistry. Prospectus on application to the Principal. (See our advertisement pages to-day.)

An Automatic Coaling Installation.

Referring to the article under the above heading in our issue of August 15th, describing the equipment at the Kipps Depôt of the L. & N.E. Railway, we are interested to learn that "Harland" motors, by the Harland Engineering Co., Ltd., of the standard squirrel-cage and "Magnastart" high-starting-torque types, were installed for the power units by Messrs. Henry Lees & Co., Ltd.

Electricity from Blast-furnace Gas in France.

In a note presented to the Société Française des Electriciens on interconnections between electrical installations of the metallurgical works in the Bassin de Briey, Monsieur L. Sekutowicz gives some details of the work accomplished by the Société de la Sidérurgie Lorraine.

This company was formed soon after the European war to supply electrical energy, to mines and metallurgical undertakings, from blast-furnace gases which previously had been wasted. In the Lorraine district there are a hundred blast-furnaces in French territory, belonging to twenty undertakings, capable of producing seven million tons of pig iron per year, and of these undertakings ten, with sixty blast-furnaces, have been interconnected at 65,000 V. The greatest distance covered is 60 km. Another distribution system at 30,000 V is employed to connect mines and less important metallurgical works. The total power available at present is about 125,000 kW, obtained from five 4-cylinder gas engines of 22,000 kW, twenty 2-cylinder gas engines of 50,000 kW, and fifteen steam turbines of 45,000 kW aggregate capacity. In addition, six groups of convertors connect works equipped for direct current, and provide 30,000 kW. The gas engines produce about 56 per cent. of the total output. The gas engines are of various types, and they work on the 4-cycle principle at 94 r.p.m.

The success obtained by these equipments may be realised from the facts that the energy exchanged has risen from eight million units in 1923 to 137 millions in 1929, while in 1931, with additional plant now being installed, the total is expected to reach 200 million units. The annual revenue from this power is about 20 million fr.—a revenue which was previously lost. Indeed, it has been necessary to seek other outlets for the power, particularly during the night. The company's plant is already connected with the important distribution systems in Alsace, Lorraine, and the Vosges, and recently it has participated in the formation of two new organisations, which propose to construct high-pressure lines to connect with Paris and the north of France.

Scientific Co-operation within the British Empire.

Last week we reported the application to the Board of Trade for a license to form an association for the promotion of co-operation between scientific and technical societies within the British Empire. The Association is to be limited by guarantee and to have no share capital. The governing body will be a council of not less than 25 or more than 30 members, of whom 10 are to be elected and the remainder nominated.

The following bodies are to have the right of nomination of council members: Institution of Mining and Metallurgy; Institution of Mining Engineers; Institution of Petroleum Technologists; Iron and Steel Institute; Institute of Metals; Institute of Fuel; The Chemical Society; The Society of Chemical Industry; Institution of Chemical Engineers; Institution of the Rubber Industry. Provision is made for adding to this list.

The fee for ordinary membership of the Association or for the right of nominating a member is £20.

It will be remembered that several articles have appeared in the ELECTRICAL REVIEW in which benefits of scientific co-operation have been discussed; for the most recent see issue of April 18th, 1930 (pp. 718 and 724).

Origin of the Dynamo.

Recent reports in the Press on the plans for the celebration of the Faraday Centenary next year have referred to August 29th, 1831, as the date of the epoch-making experiment on which the modern electrical industry is based. In the correspondence columns of *The Times* the question has been raised as to whether the significant date should not be October 17th of the same year, when Faraday discovered what he called magneto-electric induction (the movement of a bar magnet in and out of a coil of wire which led to the discovery of the dynamo) as distinct from "volta-electric induction" of the earlier experiment (in which it was found that electric currents were induced in wires surrounding magnets, and which led to the discovery of the transformer).

Mr. Thomas Martin, general secretary of the Royal Institution, in reply, points out that Faraday's discovery of electro-magnetic induction derives, not from a single experiment, but from a series of experiments which Faraday began on August 29th and carried on for many weeks into the early part of 1832. By this series of investigations, he established the fundamental principle upon which the dynamo, the motor, the transformer, and all electro-magnetic appliances are now based. The actual date of the centenary is being taken as August 29th, because on that date Faraday made the first successful experiment, the forerunner of all that followed.

Electricity in Sweden.

According to preliminary statistics issued by the Board of Trade (Kommerskollegium), the consumption of electric power in Sweden in 1929 amounted to 4,982 million kWh, as compared with 4,409 million kWh in the preceding year. The Government is the largest producer of electrical energy in Sweden, one-third of the 1929 total having been produced at the six large hydro-electric power stations managed by the Waterfall board (Vattenfallsstyrelsen). The production in 1929 at the Trollhaettan-Lilla Edet station was 1,005 million kWh, as compared with 964 million kWh in 1928 and 893 million kWh in 1927. The increase in production at the other power stations in Central Sweden has been rather small. The larger demand from the pulp and paper mills in the Umeaa, Oernskoeldsvik and Hernoesand districts is reflected in the figures for the Norrfors power station: 119 million kWh for 1929, 101 kWh for 1928, and 95 kWh for 1927. A considerable exchange of power with Denmark resulted in a surplus of exports on the part of Sweden. The power produced in Sweden is, however, chiefly used at home 4,364 million kWh out of the total of 4,982 million kWh being consumed in Sweden last year. The industrial consumption of power in 1929 formed 83 per cent. of the total. Consumption by the railways and tramways has considerably increased of late years owing to the electrification of the State railway line between Stockholm and Gothenburg. The total gross earnings of the electric power stations for the year were Kr. 133,000,000, as compared with Kr. 126,000,000 for 1928, including Kr. 23,500,000 from the Government's power stations. The electric power industry is rapidly expanding. Building activity in the industry is nowadays concentrated on a comparatively small number of installations of great capacity. No large new power stations were started in 1929, but that was the first year of full activity at the big Hammarforsen and Kraangforsen hydro-electric stations in North Sweden. At the beginning of 1930 the big new Karseforsen works (44,000 h.p.) on the Lagan, belonging to Sydsvenska Kraftaktiebolaget, began operations, and during the spring of 1930 the Lanforsen works (25,000 h.p.) on the river Dal. The latter works are jointly owned by the town of Stockholm and Sandvikens Jaernverk. The Waterfall Board has begun work on the new Vargoen station near Trollhaettan, and is planning new hydro-electric stations at Sillre in Central Norrland and Malfors on the Motala Stroem in Oestergoetland, the latter for the future electrification of the State railway line between Stockholm and Malmoe. The question of erecting a plant at the powerful Kraangede falls on the Indal river is now approaching solution.—*Reuter's Trade Service* (Stockholm).

Refrigeration at Sea.

In a letter to *The Times*, Mr. A. C. Hardy suggests that refrigerated cargoes have been in no small way responsible for a speeding up in the change of the type of ship propulsion which is now taking place. Once it has been established that cargoes can be refrigerated on board ship cheaply, distance becomes no object; new markets are opened up, and new types of ships are evolved to meet these new markets. He believes that the refrigerated ship of the future will be an entirely electric ship, because the load required by the refrigerators coupled with the other electrical requirements of the ship may be equal to, if not greater than, that required by the propelling machinery.

Mercury-vapour Plant.

Further particulars are now available regarding the operation of the 10,000-kW mercury-vapour plant installed at the South Meadow station of the Hartford Electric Light Company, U.S.A. The boiler was reported in the ELECTRICAL REVIEW of July 4th last to be generating steam at the over-all fuel rate of 0.716 lb. per kWh, and this average has been maintained, according to the *Electrical World*, since it was put into regular operation on February 4th, 1930, with an output of nearly 40 million kWh.

By condensing the mercury-vapour exhaust from the turbine, a further 130,000 lb. of steam per hour is made available at a pressure of 275 lb. per sq. in. and 700 deg. F. for the normal sets in the power station. The load is controlled by varying the pressure on the mercury boiler. The mercury-vapour section of the boiler house is operated by two men.

The company considers that the process has been proved to be sound, both in theory and practice. The present position has been arrived at as a result of seven years of experience, experiments having been started with a 1,800-kW turbine and two boilers at the company's Dutch Point station in 1923.

Some troubles were experienced at Dutch Point in the initial stages, due to failures of material and to mercurial poisoning of the operators. These difficulties are said to have been overcome, and no case of poisoning has occurred in six years. The earlier cases of poisoning were in no case serious. The failure of a tube at South Meadow station caused a considerable amount of mercury to escape to the furnace, but as mercury at atmospheric pressure condenses at a temperature of 675 deg. F., a very large percentage was recovered; apart from this, there has been no loss of mercury from the present installation. An earlier failure of a header at Dutch Point had no untoward consequences; owing to the low specific heat of mercury, there was no disruption or other violent action and no injury to the settings.

The use of mercury has caused no difficulty, as it is absolutely stable, and no interference from oxidation or other causes has been experienced. Difficulties have been found in the mechanical handling of mercury, and, owing to its cost and weight, equipment has been developed to use a minimum quantity. The boiler, piping, valve bodies, condenser, and turbine casing are all of low-carbon steel. Mercury vapour has a low nozzle velocity, only one-third that of steam, so all turbine dimensions are large, and the speed (720 r.p.m.) is relatively low.

The economies expected are such as to wipe out the excess in capital expenditure over that of steam plant in 3½ years.

Fatalities.

The inquest on John William Hibberd, aged 28, an electrician employed by the Chelsea Electricity Supply Co., Ltd., who was killed recently by receiving an electric shock in a junction box in Gunter Grove, Chelsea, was held on August 20th. Giving evidence, Dr. Bronte, the pathologist, said that a Home Office pamphlet stipulated that in cases where workmen were electrocuted artificial respiration should be continued for a minimum period of four hours. A case was on record, he said, where a man who had received a very severe shock was restored to life after four hours' artificial respiration; he completely recovered. "It is said," added Dr. Bronte, "that in executions by the American method (the electric chair), death only takes place in the post-mortem room."

A verdict of accidental death was recorded.

While installing electric lights in his shop on August 21st, Gordon Sale, aged 26, a photographer of North Bridge Street, Shefford, Beds., received an electric shock and died.

The inquest was concluded recently at Ilkeston on Samuel Oldknow, aged 36, of Ilkeston, who died as a result of an electric shock in the Tupton pit of the Cossall Colliery on August 11th. Chas. Henry Smith, who was working with the deceased man, said that he was pulling and deceased was pushing a conveyor pan, when the pan was dragged to the ground. He shouted "Switch off," and then saw Oldknow lying across the pan, which fell on the electric cable. John Hunter, chief electrical engineer, said it was his duty to examine the cable used for the electric coal-cutters from time to time. The cable in question had been in use four months. It was one of the best obtainable for the work it had to do, and with careful handling it would last ten years. The voltage was about 250. Witness's opinion was that a piece of coal or "bind" was either adhering to the cable or the pan, or that the pan dropped and drove the substance into the cable, thus making contact. He did not think it was possible to take any additional precautions to prevent a similar accident. A verdict of "Accidental death" was recorded, no blame being attached to anyone.

Conservatory Heating.

The new conservatory at Greenhead Park, Huddersfield, which has cost nearly £6,000, and is especially intended to house representative plants from all parts of the world, is heated by electricity, thermostatically controlled to maintain an even temperature automatically, whatever may be the conditions outside. It is the first public park conservatory to be so heated in the district.

Appointments Vacant.

Deputy electrical engineer for the Derby Corporation.

Probationary inspectors in the Engineering Department of the Post Office for the Civil Service Commissioners.

Shift engineers for Gold Coast Government Railway.

Electrical foreman for the Gambia Government Public Works Department.

Electrical engineers for the Mains Department of the Calcutta Electric Supply Corporation, Ltd.

(See our advertisement pages to-day.)

Rural Supplies in Cheshire.

The recent developments in the application of electricity to the needs of the countryside in Norfolk and Bedfordshire should serve as a reminder of the good work that has also been carried out in other areas towards rural electrification.

Prominent among these is Chester Corporation, which, due to the enterprise of its electrical engineer, Mr. S. E. Britton, may claim to be well in the van of progress in this respect.

The Corporation began to supply electricity in the rural outskirts of Cheshire in 1924.

The Corporation has powers to supply 140 square miles of rural area, and, according to the *Cheshire Observer*, it has, up to date, erected 130 miles of overhead lines. Chester is already supplying electrical energy to 3,000 rural consumers, including 200 farms, numerous trades, and rural industries. Farmers in the Chester area readily state that the supply of electricity is the greatest economical factor which has been placed at their disposal for the past 25 years. Poultry houses are being lighted by electricity, milking is being done by the same power, and there is no limit to the uses made of it in the house. It was stated in the House a few months ago that the Cheshire and another scheme proved abundantly that it was possible for the farmer's wife to light the house, do the cooking and cleaning, churn butter, and make cheese, while the farmer was able to plough, draw hay, crush cake, thresh corn, and chop chaff. Wherever electric wires have gone in the Chester district, it has been noticed that new houses have sprung up; thus electricity has helped to solve the housing problem. Moreover, with electric power available, rural businesses have been able to extend their activities.

Rust Removal.

A recipe for economical rust removal is given by the *American Machinist*. The composition is: 3 oz. petrolatum, 2 oz. P.907 oil, and 6 oz. tripoli. The oil and petroleum are steamed together until they are warm. Then the tripoli is added and the mixture stirred until it is smooth. When spread on rusty tools or parts and rubbed off with a cloth, this mixture will remove, it is claimed, the most stubborn coat of rust.

I.E.E. London Students' Tour.

This year the summer tour organised by the London Students and Graduates Section of the Institution of Electrical engineers was held in Germany and Switzerland, 39 members of the London and provincial Centres taking part. On August 2nd the party proceeded to Dover, had a good crossing to Ostend, spent the afternoon sightseeing, and arrived in Cologne about midnight. On the Sunday afternoon a charabanc trip was taken to Bonn, Konigswinter, and the Drachenfels mountain. The official programme of visits began on the Monday (August 4th) with a visit to the chemical works of the I.G. Faberindustrie A.G. at Leverkusen, outside Cologne, which the party left the next morning for a long train journey down the Rhine, the ultimate destination being Zurich, where all types of Oerlikon electrical machinery were seen. The next day was spent in Basle visiting the factories of Messrs. Emile Haefely & Co., where the party saw the manufacture of bakelite insulation in all its stages, and witnessed some interesting high-voltage flashover tests on different types of insulators. The following morning a visit was made to Messrs. Sulzer Bros., at Wintertur, and in the afternoon the party proceeded to the Brown Boveri works at Baden. The next day, Saturday, the Hürlimann brewery outside Zurich was inspected, and in the afternoon charabancs set off for Meiringen, *via* Zug and Lake Lucerne. The night was spent in Meiringen, and next morning the party proceeded to the Aar Gorge and Innertkirchen, where the transformer station and controlling switchgear belonging the Oberhasli Company was inspected; up the Grimsel Pass, the party stopped at Handeck and was taken all over the power station, and a thorough inspection of the damming operations on the lake was made. After luncheon at the new hospice, the students proceeded to the top of the Grimsel Pass, and down through the Furka Pass, stopping to see the Rhone Glacier. Thence the route lay through Gletch to Andermatt, thence to Goschenen and home *via* Lucerne. On Monday, August 11th, a visit was made to the Polytechnic Engineering School in Zurich, and later to the University. The party travelled all night to cross from Ostend on the Tuesday morning boat, arriving in London in the late afternoon, having had a most interesting and enjoyable trip in ideal weather.

Direct-current Transmission.

It is believed that the possibilities of the "Thyratron" tube are not confined to the function of control, but that it may eventually be the means of transmitting electrical energy over relatively long distances in the form of direct current. An experimental miniature transmission line has been set up in a research laboratory in the United States and equipped with such tubes. The line itself was represented by a copper bar about eight feet in length, and ohmic resistance was imposed to make the line equivalent to 400 miles of transmission conductor in a commercial system.

At the sending end a bank of "Thyratron tubes" functioned as rectifiers, to convert alternating current into direct current for transmission purposes. At the receiving end other "Thyraton" tubes functioned, in pairs, as inverters. The source of supply was a bank of transformers which furnished alternating current at 15,000 volts. Transmission of the power was accomplished without difficulty, and the receiving-end tubes delivered the energy to transformers, which reduced the pressure to the voltage of the working circuits in the laboratory shop. The experiment was later repeated with the addition of a "double-conversion" process at the receiving end.

Generation of Electricity.

The official returns rendered to the Electricity Commissioners show that 786 million kWh were generated by authorised undertakers in Great Britain during the month of July, 1930, as compared with 732 million kWh in the corresponding month of 1929, or an increase of about 7.4 per cent.

During the seven months of 1930. up to the end of July, the total amount of electricity generated by authorised undertakers was 6,167 million kWh, as compared with 5,830 million kWh for the corresponding period of 1929, representing an increase of 5.8 per cent.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. F. Nicholls, deputy borough electrical engineer, has been appointed by the Derby Town Council to succeed Mr. G. H. Lake, who is going to Nottingham, as borough electrical engineer, at a salary of £1,100 per annum.

Mr. Nicholls, who is 44 years of age, was educated at Battersea Polytechnic and received his engineering training with Messrs James Simpson & Co., London, and at Newark. He subsequently gained experience with Messrs. John I. Thornycroft & Co., Southampton, and the Royal Mail Steam Packet Co. His early electrical training was with Mr. P. E. Rycroft at Heston and Isleworth. During the war he served with the R.N.D. and took part in the Gallipoli operations in 1915. In 1917 he joined the Birmingham Electric Supply Department as a shift engineer and remained there until 1920 when he became boiler-house superintendent at Derby. In 1924 he was promoted to the position of generating engineer and was appointed deputy borough electrical engineer in 1926. Mr. Nicholls is an associate member of the I.E.E. and a member of the Institution of Marine Engineers.

Mr. C. Culmer Hodges, A.M.I.E.E., of Dawlish, has been appointed engineer and manager of the St. Austell and District Electric Lighting and Power Co., Ltd., as from August 15th. He is retaining his position at Dawlish until August 31st.

Mr. W. Lee Mathews, a director of Messrs. Thomas Bolton and Sons, Ltd., who has managed their London business for more than 30 years, has resigned on account of ill-health. **Commander W. T. Bird** has been appointed sales manager for the London district.

Sir William Noble, a director of the General Electric Co., Ltd., and formerly Engineer-in-Chief of the G.P.O., returned last week from Russia.

Mr. Joseph Taylor, hon. secretary of the Scottish Centre of the Institution of Electrical Engineers, notifies us that his address is now 74, Waterloo Street, Glasgow.

Mr. J. D. Parkinson, formerly of the Hull Corporation Electricity Department, sailed last week for China to take up the position of assistant distribution engineer to the China Light and Power Co.

Mr. Bert Wilson, the well-known artist, who for many years has been responsible for the art work of the Metropolitan-Vickers Co., of Trafford Park, Manchester, recently relinquished his position with this concern and has launched into business on his own account as a free lance commercial artist. His studios are situated at 7, St. James' Square, Manchester.

Mr. A. H. Roe, partner in the firm of Roe & Bowley, electrical engineers, of Tutbury, was married to Miss M. E. Ramsden on August 20th.

Mr. J. R. Mills, until recently on the staff of the advertising department of the Edison Swan Electric Co., Ltd., has been appointed advertising manager of the "Sunray Tricity" department of the British Electric Transformer Co., Ltd.

Mr. F. M. Calcutt, chief engineer of signals and telegraphs on the Victorian Railways, has retired after 47 years' service. He joined as a draughtsman in 1883, and ten years later was transferred to the construction branch. In 1913 he made a tour of England, the Continent and America, studying automatic signalling on electric railways, and his recommendations were adopted for the Victorian electric railway system.

OBITUARY.

Mr. G. G. Sim.—We regret to report the death of Mr. G. G. Sim, C.S.I., C.I.E., deputy-chairman of Vickers-Armstrongs, Ltd., and Vickers, Ltd., which occurred on August 20th. Mr. Sim, who was 52 years of age, had had a distinguished career in India prior to joining Vickers, Ltd., as secretary in 1926.

Mr. Christopher Bentham, director and secretary of the Ingleton Electric Light & Power Co., Ltd., passed away at Ingleton recently at the age of 77.

Mr. I. Sternefeld.—*The Times* reports the death, in Paris, of Mr. I. Sternefeld, who for some years had been in the service of the Westinghouse Electrical Co., representing it in the Far East and the principal European countries.

Will.—**Mr. A. J. Thomas,** electrical engineer, of Newton Abbot, left £2,966 gross, with £1,937 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

South Staffordshire Tramways Co., Ltd.—This company (originally constituted by the South Staffordshire Tramways Act, 1889), was registered on August 16th as a public company limited by shares, under the Companies Act, 1929. Capital, £216,230 in 8,658 6 per cent. preference shares of £10 each and £129,650 ordinary stock. To August 13th, 1930, 7,600 preference shares and £128,648 ordinary stock had been issued. The directors are: W. G. A. Bond, 125, Harborne Road, Edgbaston, Birmingham; P. M. Rossdale, 15, Gunnersbury Avenue, W.; J. A. Lycett, Lyndholm, Kidderminster (all directors of the South Staffordshire Tramways Lessee Co., Ltd.). Secretary, C. W. Francis. Registered office, 88, Kingsway, W.C.2.

Majestic Distributors (Manchester), Ltd.—Private company. Registered August 21st. Capital, £100 in £1 shares. Objects: To carry on at Manchester and elsewhere the business of an electric light company in all its branches, &c. The directors are: W. E. Holt, Sandy Brow, Bury Road, Rochdale; B. W. J. Bryan-Rennell, 9, Washway Road, Sale, Ches. Secretary, Norah P. Bryan-Rennell. Registered office, 2, Victoria Bridge, Salford, Lancs.

Vince's Dry Batteries, Ltd.—Private company. Registered August 20th. Capital, £8,000 in £1 shares. Objects: To carry on the business of manufacturers of dry batteries, &c. The directors are: C. H. Vince (chairman), 41, Natal Road, Ilford; C. H. Vince, Junr., Winifred M. Mennie-Vince, and E. M. Gorst, addresses not stated; G. E. Fisher, Stonehenge, 68a, East India Dock Road, E.14. Secretary: Lucretia E. May, 12, Sussex Street, Poplar, E.14.

Hewelectric Co., Ltd.—Private company. Registered August 20th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical and wireless engineers and general salesmen carried on by H. Hewett and G. E. Hewett at 1, Churchill Parade, Kenton Road, Kenton, Middlesex. The first directors are: H. Hewett, electrical engineer, and G. E. Hewett, salesman, 1, Churchill Parade, Kenton Road, Kenton; G. A. J. Little, 50, Prout Grove, Neasden, N.W.10. Solicitors: Jordan & Lavington, 78, Queen Victoria Street, E.C.4.

Lincoln Smethurst, Ltd.—Private company. Registered August 16th. Capital, £5,000 in 400 7 per cent. cumulative preference shares of £10 each and 1,000 ordinary shares of £1 each. Objects: To acquire the business of a wholesale electrical and radio engineer now carried on by Lincoln Smethurst, at 17, Hanover Buildings, Southampton, as "Lincoln Smethurst." The permanent directors are: L. Smethurst, 17, Hanover Buildings, Southampton; A. R. S. Fowler, 10, Oakhurst Road, Highfield, Southampton. Solicitors: Moberly and Wharton, Southampton.

F. G. Stokes, Ltd.—Private company. Registered August 21st. Capital, £12,000 in £1 shares (8,000 8 per cent. participating cumulative preference and 4,000 ordinary). Objects: To carry on the business of manufacturers of synthetic resins and insulating moulding compounds, formerly carried on by Frederick G. Stokes at Hartington Road, Broadheath, Ches., and that of manufacturers and merchants of chemicals, chemical products, hydraulic presses, &c. The permanent joint managing directors are: F. G. Stokes, 8, Bowness Street, Stretford, Manchester, engineer (director of Small Mouldings, Ltd.); E. J. Lassen, 44, Park Drive, Heaton, Bradford, company director (chairman). Registered office, Hartington Road, Broadheath, Ches.

Chas. Swain, Ltd.—Private company. Registered August 16th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in gramophones and sound reproducing machines, electric accumulators and batteries, wireless aerials, cabinets, condensers, headphones, loud-speakers, transformers, &c. The directors are: E. E. Rooke, 67, Hazelwood Lane, N.13 (director Rooke Bros., Ltd.); J. W. Miller, 63, Hampton Road, Forest Gate, E. Registered office: 55, Cardington Street, N.W.1.

G. P. Cosway, Ltd.—Private company. Registered August 18th. Capital, £500 in £1 shares. Objects: To acquire the business of a general, electrical and mechanical engineer carried on by G. P. Cosway at Princes Street and Anker Street, Nuneaton. The directors are: G. P. Cosway and Mrs. L. Cosway, 10, Manor Park Road, Nuneaton. Secretary: Kathleen L. Cosway. Registered office: 2, Princes Street, Nuneaton.

Goldvick Electrical & Radio Co., Ltd.—Private company. Registered August 18th. Capital, £250 in £1 shares. Objects: To acquire the business of an electrical and radio merchant (wholesale and retail) now carried on by V. Morris at 138, Gray's Inn Road, W.C.1, as the "Goldvick Electrical and Radio Co." The permanent directors are: V. Morris, 138, Gray's Inn Road, W.C.1; Goldie Morris, 121, Priory Road, West Hampstead, N.W.6.

Ryall Manufacturing Co., Ltd—Private company. Registered August 22nd. Capital, £1,000 in £1 shares. Objects: To acquire the business of a wireless and electrical engineer carried on by F. M. Kinsey at 38a, Goldstone Villas, Hove. The permanent directors are:—F. M. Kinsey, Ashmore, Meadway, Shoreham-by-Sea; T. Parkinson, "Perton," Beach Road, Shoreham-by-Sea. Secretary: Miss Doris A. M. Case. Registered office: 38a, Goldstone Villas, Hove, Sussex.

Official Returns of Electrical Companies.

Cirencester Electric Supply Co., Ltd.—Issues on various dates from August 29th, 1922, to March 3rd, 1928, of £3,700 debentures, parts of a series already registered. (Particulars of issues filed August 12th, 1930.) Satisfaction in full on June 30th, 1930, of debentures authorised April 25th, 1922, and registered July 27th, 1922.

Dowsing Radiant Heat Co., Ltd.—Deposit on July 30th, 1930, of deeds of the Portman lease of premises at 40, Dorset Square, N.W.1, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

Gamble & Sons, Ltd.—Capital, £4,000 in £1 shares. Return dated June 24th, 1929 (filed April 22nd, 1930). 350 shares taken up. £350 paid. Mortgages and charges, nil.

Stanley Cox, Ltd.—Capital, £2,200 in 1,500 8 per cent. cumulative preference and 700 ordinary shares of £1 each. Return dated December 31st, 1929. 1,000 preference and 700 ordinary shares taken up. £1,700 paid. Mortgages and charges, nil.

Permec, Ltd.—Capital, £100 in 1s. shares. Return dated December 31st, 1929 (filed March 11th, 1930). All shares taken up. £100 paid. Mortgages and charges, nil.

Brandes, Ltd.—Capital, £20,000 in £1 shares. Return dated December 31st, 1929 (filed June 26th, 1930). All shares taken up. £10,392 paid. £9,608 considered as paid. Mortgages and charges, nil.

C. J. Plucknett & Co., Ltd.—Capital, £20,000 in £1 shares. Return dated December 30th, 1929 (filed April 14th, 1930). 15,007 shares taken up. £7 paid. £15,000 considered as paid. Mortgages and charges, £3,000.

C. G. Carlisle & Co., Ltd.—Capital, £7,000 in £1 shares. Return dated June 21st, 1929 (filed May 9th, 1930). All shares taken up. £7,000 considered as paid. Mortgages and charges at date of return: £216 (since paid off).

Electro Acoustics, Ltd.—Capital £250 in £1 shares. Return dated December 31st, 1929 (filed May 9th, 1930). 53 shares issued and fully paid up. Mortgages and charges, nil.

Macfarlane Electrical Co., Ltd.—Capital, £3,000 in £1 shares. Return dated December 31st, 1929. All shares taken up and fully paid in cash. Mortgages and charges, nil.

Abba Electrical Co., Ltd.—Capital, £9,000 in £1 shares. Return dated October 30th, 1929 (filed July 30th, 1930). 8,000 shares taken up. £6,500 paid, £1,500 considered as paid. Mortgages and charges, nil.

Eons Electrical Co., Ltd.—Debenture date July 30th, 1930, to secure £600, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Miss H. M. Wicks, 14, Wilson Street, Derby.

Baxter & Caunter, Ltd.—Satisfaction in full on August 6th, 1930, of two charges to Lloyds Bank, Ltd., dated March 6th, 1929, and registered March 19th, 1929.

Carter & Co. (Nelson), Ltd.—Capital, £5,000 in £1 shares. Return dated July 17th, 1930. 4,150 shares taken up. £4,150 paid. Mortgages and charges: £258.

Liverpool Electric Cable Co., Ltd.—Capital, £300,000 in £1 shares. Return dated July 29th, 1930. 150,000 shares taken up. £127,833 paid. £22,167 considered as paid. Mortgages and charges, £34,671 13s. 4d.

City Notes.

General Electric Co., Ltd.

It is reported that a writ has been issued against the company by the Earl of Midleton, Sir Edwin Cornwall, and Sir William Burton (joint holders of £750,000 ordinary shares) seeking a declaration that they are entitled to vote at the company's meetings. It will be recalled that at the last annual meeting (*vide* ELEC. REV., July 4th, p. 25) Sir Edwin Cornwall said that the question had been raised whether the shares which he and others held were under full British control. He and Lord Midleton assured the meeting that the shares were absolutely owned and controlled by them and they wished to tender their votes. Sir Hugo Hirst replied that the directors had thought fit, in their endeavour to do their duty, to act according to the articles of association and, without making any reflection whatever on the good faith of Sir Edwin Cornwall and his co-shareholders, they had come to the decision that at the moment they had to raise objection to their voting powers. Sir Edwin Cornwall formally opposed the re-election of the retiring directors, but the motion was carried upon a show of hands. When a poll was demanded and granted, the chairman rejected the votes of the three shareholders and the motion was again carried.

Venezuela Telephone & Electrical Appliances Co., Ltd.

In a letter to shareholders the directors state that during the past year unexpectedly favourable development has taken place and acquisitions have been made, necessitating the increasing of the directors' borrowing powers to the amount of the issued capital (£410,925) plus £250,000. It is also thought desirable that local capital should be interested in the company's development. A local company, the Cia. Anonima Nacional Telefonos de Venezuela has taken over a 30-year concession granted by the Venezuela Government covering the whole of the republic. It is proposed to effect a fusion of interests, and, if thought desirable, to vest the assets of the company in the new local company by an exchange of shares on an equitable basis. These proposals are to be considered at an extraordinary general meeting which has been called for September 10th.

Sphinx Electric, Ltd.

Dr. James Mackinnon presided at an extraordinary general meeting on August 26th and moved a resolution for the voluntary liquidation and reconstruction of the company. An amendment was proposed and carried, however, that the voluntary liquidation should proceed without reconstruction, and Mr. T. Froude, 1, Queen Victoria Street, E.C.4, and Mr. D. H. Freeman, 28, King Street, E.C.4, were appointed joint liquidators.

Crompton Parkinson, Ltd.

The report for the year ended June 30th last shows a net profit of £103,614, after providing for depreciation, directors' fees, &c., as compared with £85,272 for 1928-29. To this is added £50,358 brought forward, making £153,972 available. After meeting the balance of the dividends on the first and second preference shares and transferring £15,000 (against £13,500) to reserve, it is proposed to pay a final dividend of 18¾ per cent. on the ordinary shares, again making 30 per cent. for the year, leaving £60,708 to be carried forward. During the year an issue of 200,000 ordinary shares of 5s. each was made. Mr. E. J. Fox has been appointed to the board in the place of the late Mr. A. A. Campbell Swinton. Meeting: September 18th.

Hydro-Electric Securities Corporation.

The net ordinary income for the half-year ended June 30th amounted to $1,950,391, equivalent to $0.96 per common share, as compared with $986,687, or $0.63 per share, in the first half of 1929.

Westinghouse Electric and Manufacturing Co.

It is reported that after meeting taxation and providing for reserves, &c., the net profit for the first half of the current year is $8,357,362 (against $13,131,381).

American Telephone & Telegraph Co.

The regular quarterly dividend of $2.25 per share has been declared.

Stocks and Shares.

TUESDAY EVENING.

Now that the City stands upon the edge of September, the feeling grows that, with holidays coming to an end, there is an increase in the scope for business improvement. The curious anomaly is presented of most people talking pessimistically, but being in complete agreement that such pessimism is overdone. To this, they add the conviction that prices of stocks, shares, and commodities are standing at unduly low levels, though when it comes to individual investment, the tendency is to hold back rather than make purchases at the present time. Every quarter of the business-compass is being closely scanned for indication of such pointers as will encourage the hope that depression is to be replaced by activity. The pleasant contribution to cheerfulness is made by Crompton Parkinson & Company, whose preliminary statement for the year ended June 30th shows a profit of £103,600, an increase of £21,000 above that of the previous twelve months.

Utility Companies in America.

American utility companies are beginning to get into a more prosperous stride, and the protracted flatness of the New York market is broken occasionally by a spasm of public activity in stocks and shares. One of the most important of the utility companies in the United States is City Services, which has a roll of shareholders numbering three quarters of a million. In a progress report issued the other day, the company showed that its July profits were nearly 42 per cent. higher than those of July, 1929. The company makes a very poor return on its ordinary stock, last year's being a shade under 1¼ dollars per cent. The preferred shares of no par value are quoted in London at 92½: the last mark recording business was at 84½ in the middle of July. The International Hydro-Electric system, formed some eighteen months ago to combine power companies in America, announces earnings of 3½ million dollars for the year which finished with last month. The figures compare with a little less than 3 million dollars for the twelve months ended March 31st last. The Hydro-Electric Securities Corporation, of Quebec, most of whose money is employed in public utility enterprises in the United States, received a net income of $1,130,000 for the second quarter of the current year. This is twice as much as the amount secured in the corresponding quarter of the previous year. The Brazilian Traction Company reports net earnings for July of $2,450,000, showing a small increase.

These illustrations are given to demonstrate that in spite of the financial collapses which have occurred in America, and the large amount of unemployment from which the country is suffering, the utility companies are going steadily ahead. American undertakings concerned with luxury businesses have been severely hit; in the general fall of prices, the shares of the utility companies have suffered with the rest. They have not escaped the general tendency as the shares of the English companies have done. In every case the shares of the best London Electricity supply companies show improvements since the beginning of this year.

Dollar Stocks.

Braziiian Tractions, in spite of the increased earnings, are flat at 32½, showing a drop of 3 points. The company's preference stock has fallen 10 to 115. Power Corporation of Canada at 67 is unchanged: Pennsylvania Water & Power at 75½ shows a small gain, and Shawinigan Water at 66½ is up a point. The Mexican group is heavy, the outstanding movement being a drop of 2½ points in Mexican Light & Power common to 62¼. Winnipeg Electric 5 per cent. registered mortgage debenture stock has advanced to 88. Radio Corporation shares are flat at 41, and Hydro-Electrics at 31½. International Holdings are no better than 3⅜.

Amongst other issues, Anglo-Argentine Tramways second preference, of £5 each, are almost a nominal market at 35s. Atlas ordinary weakened to 23s. 6d.

Cables and Wireless.

Imperial & International Communications, in publishing the July traffic receipts, announces an increase of £24,000 over those of the preceding month. The total of £437,000 goes against £515,000 for July last year. Traffics for the past seven months of 1930 are substantially down from those of the corresponding period of last year, but the mere fact of July showing an increase was hailed with satisfaction. Price-changes on the week are, however, again in the downward direction, the preference being quoted at 72½. Other movements in the cable group are of little consequence. Anglo-American Telegraph deferred stock at 24½ has risen the fraction. On the other hand, Marconi Marine have gone back to 36s. 3d. Canadian Marconis are quoted at 17s. 6d. xriddle.

Gilt-edged Securities.

Fresh advances have occurred in the gilt-edged stocks, not only of the Consol market, but of that concerned with the electricity supply companies. The County of London 5 per cent. debenture stock that was obtainable at 100 free of stamp and fee, now costs 102. Edmundsons' Electricity Corporation 5 per cent. debenture has risen to 97½, and Newcastle-on-Tyne Electric 5 per cent. debenture to 4½ premium

on the issue price of 96. The amount of Home Railway prior-charge stock available for investment has again diminished, but there remains £2,500 London Electric 5 per cent. debenture stock, 1985-1995, on offer at 101½. This stock came out in the middle of July at 97½. London Power 5 per cent. debenture is harder at 102.

The strength of the market in the London companies' shares is well maintained. County of London Electric have receded to 43s. 9d., in consequence of sales by people who found themselves obliged to realise sound investments in order to provide themselves with money with which to meet other obligations. There has been a good deal of this kind of selling, which is always concomitant with liquidation such as that which occurred throughout the greater part of August.

Provincial Electricity.

Some of the provincial electricity shares are a little lower. Lancashire Light & Power eased off to 23s. 6d., Midland Counties to 26s. 6d., falls of sixpences in both cases. On the other hand, Newcastle-on-Tyne 7 per cent. preference put on 1s., the price rising to 27s. A good deal of interest is taken in the statement that negotiations are in progress for the complete electrification of an area of a hundred square miles in Norfolk. According to current talk, the directors of a big supply undertaking have announced their opinion that rural electrification in East England is impracticable, and the contemplated action of the Board is to serve as a reply to this view. This week's principal cartoon in *Punch* deals with the subject as aptly as gracefully. The Newcastle-on-Tyne Electric Supply Company has placed a contract valued at £200,000 for the site, works, and foundations of the new Dunston-on-Tyne power station. The work is expected to provide employment for four hundred men.

The Home Railway Market.

Interest in the Home Railway stocks has ebbed, and there are falls marked against Districts at 75, and Underground Electrics at 23s. 6d. Central London ordinary assented stock maintains its price at 78, and there has been a little inquiry for some of the other lesser-known issues associated with this group. The non-assented ordinary stock of the Central London Railway is quoted at 68, the non-assented preferred at 60, stock having changed hands a fortnight ago at 58, while the deferred non-assented stands at 75½. The deferred assented stock is quoted at 78 middle, the same price as that of the two other assented stocks, ordinary and preferred. London Electric Railway ordinary stock, after being a firm market, has gone back to 72, the price moving in sympathy with that of Districts. The two stocks are, as already mentioned, comparable in most respects, save for the fact that in Districts there is a much better market than there is in London Electric ordinary. To the permanent investor, this is of no particular disadvantage, and it is cheaper, therefore, for him to buy London Electrics than Districts. Underground Electric 5 per cent. first mortgage debenture is in demand by reason of the investment inquiry for everything of gilt-edged character. The company's 6 per cent. first income debenture stock, which is redeemable, is changing hands on the basis of 105.

Miscellaneous.

In the iron and steel group, Babcock & Wilcox have further relapsed, the price now being 50s., at which the return on the money is 6 per cent. free of tax, taking the last-paid 15 per cent. dividend as the basis of calculation. Vickers receded to 6s. 9d. The rubber share market is in a parlous state. Every private letter from the Middle East brings additional witness to the crisis that is affecting planting companies, and which not even the strongest are able to contemplate without anxiety.

Manufacturing and Equipment.

The fall of 7½ points to 105 in Brush ordinary is something of a feature amongst the stocks and shares in the section for manufacturing and equipment companies' issues. The stock has been a poor market ever since the time that it was created in substitution for the previous shares. For some reason or other, it has never been popular as stock, but this week's fall is no more than a reflection of the weakness which prevails amongst the shares of other industrial companies. General Electric ordinary have gone back 1/9 to 47s. Enfields, Callenders and Henleys are all lower. The shareholder in these companies who is puzzled to account for the heaviness of prices at a time when the industry is known to be doing well, may be reminded that a good many people, with loans running at the banks upon the security of other stocks and shares, have been forced to sell realisable investments in order to maintain the margins demanded by the Banks as cover against these loans. Intrinsic value in Stock Exchange securities must go for little or nothing with speculators who have to realise whatever they are able to sell, in order to provide money with which to finance commitments in stocks and shares that are not readily negotiable. This is one principal reason why shares, even in first-rate companies, have fallen sharply in price during the last few weeks. English Electrics are lower at 13s. 9d. Eleven hundred British Aluminium 6 per cent. preference, non-cumulative, are offered at a guinea. The yield on the money is £5 14s. 3d.; the present price carries five months' dividend.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Approx. Dividend. 1928.	1929.	Price Aug. 26 1930.	Rise or fall	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	56/3	—	5 4 3
Brompton Ordinary	1	8½	8½	26/6	—	5 5 8
Charing Cross Ordinary	1	8½	8½	27/6	—	5 1 10
do. do. 4½% Pref.	1	4½	4½	18/-	—	5 0 0
Chelsea	1	8½	8½	26/6	—	5 5 8
City of London	1	10	10	33/9	—	4 3 1
do. do. 6% Pref.	1	6	6	23/6	+6d.	5 2 2
Clyde Valley	1	8	8	38/3	—	4 3 9
County of London	1	7	10	43/9	−1/6	4 11 4
do. do. 6% Pref.	1	6	6	23/6	—	5 2 2
Edmundson's 7% Pref.	1	7	7	24/-	—	5 16 8
Elec. Supply Corporation	1	11	11	48/3	—	4 11 3
Kensington Ordinary	1	8	8	27/-	—	5 3 8
Lancs. Light and Power *	1	7½	7	23/6	−6d.	5 16 8
London Electric	1	8½	9	30/-	—	4 13 4
Metropolitan	1	9	10	39/6	- 6d.	5 1 3
do. 4½% Pref.	1	4½	4½	17/-	—	5 6 0
Midland Counties	1	6½	7	26/6	−1/-	5 5 8
Mid. Elec. Power	1	15	8	31/3	—	5 2 5
Newcastle-on-Tyne Ordinary	1	6	6	22/6	—	5 6 8
do. 7% Pref.	1	7	7	27/-	+6d.	5 3 8
Notting Hill 6% Pref.	10	6	6	10½	—	5 11 4
North Met. Elec. 6% Pref.	1	6	6	23/6	—	5 2 2
St. James' and Pall Mall	1	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	28/-	—	5 14 4
South London	1	8½	8½	27/6	—	5 1 10
Urban Ordinary	1	7	7	27/6	—	5 1 10
Westminster Ordinary	1	8½	8½	27/-	—	5 8 8
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	24/6	—	6 2 5
Yorkshire Elec.	1	8	8	31/3	—	5 2 5

Home Rails.

Central London Ord. Assented	Stock	4	4	78	+1	5 2 7
Metropolitan	,,	3½	4	68	—	5 17 8
do. District	,,	4	5	75	−1	6 13 4
Underground Electric	£1	7	8	23/6	−6d.	6 16 2
do. do. Income	Bonds	6	6	106	—	5 13 3

Telegraphs and Telephones

Anglo-Am. Tel. Pref.	Stock	6	6	100	—	6 0 0
do. Def.	,,	1½	1½	24½	+½	6 3 9
Automatic Telephone	1	10	12½	35/-	—	7 2 10
Cables & Wireless 5½ Pref.	Stock	—	5½	72½	−2	7 11 8
do. A 7½ Ord.	,,	—	—	20½	−1	... ...
do. B Ord.	,,	—	—	10	−½	... ...
Globe Tel. and T. Ord.	10	10	10	15½	—	*6 9 0
do. do. Pref.	10	6	6	10½	—	5 11 7
Great Northern Tel.	10	20	20	29½	—	6 15 7
Marconi-Marine	1	12½	15	36/3	−⅛	8 5 8
Oriental Telephone Ord.	1	12	12	51/3	—	*4 18 7

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref.	5	5½	5½	2 1/16	—	13 6 8
do. do. 2nd Pref.	5	6	6	12	−½	17 3 0
do. do. 5% Deb.	Stock	5	5	56	—	8 18 6
British Electric Traction Def. Ord.	,,	5	5	1450	—	... ...
do. do. Pref. Ord.	,,	8	8	123½	—	6 6 6
Brazil Traction	100	7	8	32½	−3	6 3 1
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	91½	—	5 9 9
London & Sub. Trac. 5% Pref.	1	Nil	Nil	9/-	—	... ...
London United Tram Deb.	Stock	4	4	52½	—	7 12 4
Mexico Trams, 5% Bonds	—	5	5	59	—	8 9
Mexican Light Common	100	Nil	Nil	62½	−2½	... ...
do. 7% Pref.	100	7	7	76½	—	9 3 0
do. 1st Bonds	—	5	5	79	—	6 6 7
Victoria Falls Ord.	1	15	15	58/9	−9d.	5 2 0
Yorkshire (West Riding)		Nil	Nil	5/-	—	... ...

Manufacturing Companies.

Assoc. Elec. Ord.	1	6	6	23/3	—	5 3 3
Babcock & Wilcox	1	13	15	2½	−1/6	*6 0 0
British Aluminium Ord.	1	10	10	32/9	—	5 3 3
British Elec. Transformer Pref.	1	7	7	9/9	—	... ...
British Insulated Ord.	1	15	15	33	—	4 9 0
Brush Ord.	Stock	10	10	105	−7½	9 10 6
Callenders	1	15	15	3½	−⅛	4 12 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord.	5/-	—	30	23/9	—	6 6 4
do. 8% Pref.	1	8	8	25/9	—	6 4 3
Edison-Swan 1st. Pref.	1	7½	7½	26/3	—	5 14 3
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	5	5	12/-	—	8 6 8
Enfield Cable Ord.	1	20	25	4 1/16	−1/16	6 3 5
English Electric	1	Nil	Nil	13/9	−9d.	... ...
do. do. Pref.	1	8	Nil	11/8	—	... ...
Gen. Elec. Pref.	1	6½	6½	24/3	—	5 10 7
do. Ord.	1	10	14	47/-	−1/9	5 19 2
Henley	1	25	30	5½	−⅛	5 9 1
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	7/6	—	... ...
Johnson & Phillips	1	10	10	13	—	5 6 8
Siemens Ord.	1	7½	7½	22/-	—	6 16 4
Telegraph Construction	12	10	10	18½	—	*6 9 10

* Dividends paid free of Income Tax.

Italian Trade and Industry.

Electrical Import Business Dominated by Germany.

THROUGHOUT the year (1929) under review .... there has been nothing of a sensational character; no sudden expansion of business and no ominous retrograde movement." In this way the situation in Italy during last year is summed up in a recent D.O.T. report on economic conditions in that country by Mr. E. C. Donaldson Rawlins and Dr. H. C. A. Carpenter, respectively late Commercial Counsellor and present Commercial Secretary at the British Embassy, Rome.*

From this report it is apparent that although Italy has not escaped from the effects of the world depression, those effects have not been so severe as in most other countries. This appears to be due to a great extent to the energetic support given by the Government to industrial enterprise. It is claimed that the reversion to private enterprise of a number of Government undertakings (notably the telephone system) has resulted in accelerated activity and an improved financial position. Another matter to which much energy has been devoted is the development of the country's water power as a means of providing industry with a cheap supply of electricity. In 1929 imports were still in excess of exports but the "adverse balance" was reduced from 7,361 million lire to 6,411 millions. The report says that the organisation of the Corporative State, by bringing trade categories into closer touch through their respective syndicates, has facilitated the formation of combines, or has reduced unnecessary competition and engendered more harmonious working. Through the provincial economic councils, which supplanted the old chambers of commerce, the Government has come into closer contact with the entire producing activity of the country and can step in and help where necessary. Strikes and lock-outs have been declared illegal; if negotiations are unsuccessful the matters in dispute are decided by a Labour Court, from whose verdict there is no appeal.

The Electrical Manufacturing Industry.

In spite of the fact that Italy's imports of electrical equipment remained on about the same level in 1929 as that of the previous year, it is stated that the electrical machinery industry was very active and was able to increase its exports by 4 per cent. Production is said to be greater than national requirements, and large stocks are accumulating. In the electric lamp industry negotiations are still proceeding for the formation of a consortium of manufacturers. It is hoped thereby to put the Italian industry in a position to treat for participation in the international syndicate which fixes the quota of each country, rationalises production and encourages the exchange of patents. An agreement was made recently between the chief Italian producers of wires and cables, permitting greater co-ordination in the technical field and greater subdivision of work among the various firms (taking into consideration their particular specialities), as well as a standardisation of production. Dealing with industry generally, the report shows that "rationalisation" and standardisation are being thoroughly studied, and the combination of producers has proceeded rapidly. In 1928 and the first nine months of 1929 there were 207 fusions involving 511 companies with a total capital of 8,531 million lire (92.5 lire = £1 sterling).

Electrical Import Trade.

Details of Italy's import trade are given in an appendix to the report. In this it is shown that imports of electric generators and motors declined from 26,700 quintals in 1928 to 19,400 quintals in 1929 (quintal = 220 lb.). The United Kingdom's share increased from 400 to 700 quintals, although this country was sixth in the list. The share of Germany, the principal supplier, rose from 9,600 to 9,900 quintals. There was a decline from 24,900 to 23,300 quintals in Italy's imports of miscellaneous electrical apparatus. In this class the United Kingdom was second, its share rising from 6,000 to 7,000 quintals. Germany was again the principal supplier, but its quota fell from 9,300 to 9,200 quintals. Germany supplied practically all of the electric meters imported (2,200 quintals) and also headed the list of countries of origin of telegraph and telephone apparatus imports. The total imports of the last class increased from about 9,000 quintals to 17,000 quintals. The German share rose from 3,700 to 6,400 quintals, that of the United States from 980 to 3,900 quintals, and that of the United Kingdom from 880 to 1,200 quintals. Carbons and graphites for electro-technical purposes were imported to the extent of 44,000 quintals (against 39,100 quintals). Germany supplied the greatest proportion of these, this country's share being very small. About 15½ million "electric bulbs" (against 19 million), were imported. In this trade Germany wrested the first place from Holland, while the small United Kingdom share showed a substantial decline to 67,200. Deliveries of electrical goods on reparations account fell to a negligible quantity.

* Stationery Office, 3s. 6d. net.

Hydro-electric Development.

The statistics of the Central Office of the Royal Hydrographical Service, which records about 86 per cent. of the production of power in the country, show that the electrical energy produced by 221 power stations (hydro-electric and "thermic") in 1929 amounted to 9,096 million kWh, against 8,793 millions in 1928. Of this 8,793 millions was produced by water power. The extent to which Italian hydro-electric resources have been developed in recent years is illustrated by the progress made in the Venetian provinces, in which the capacity of the installed plant rose by nearly 400 per cent. between 1922 and 1927. The principal works have been established on the Isarco, Adige, Avisco, and the Noce, in the Trentino, which will ultimately have an output of 800 million kWh per annum. A large proportion of the power generated is to be transmitted across the plains of Lombardy, so as to link up with the power systems of the industrial north-west. One such line, from Cardano (Bolzano) to Cislago (Saronno) has recently been completed; this is composed of aluminium wires of Italian manufacture. During 1929 the number of electricity supply companies in Italy decreased from 575 to 560, but their capital increased from 8,258 million lire to 10,167 millions. The loans placed abroad for electrical development total 2,455 million lire.

Communications.

During the period under review the length of electrified railways in Italy was extended by 371 km. to 1,625 km. The lines electrified were: Rome-Avezzano (107 km.), Beneventum-Foggia (101 km.), Sampierdarena-Ovada-Alessandria (74 km.) and Bolzano-Brenner (89 km.). The principal lines at present in course of electrification are: Savona-Ventimiglia, Ventimiglia-Cuneo, Avezzano-Sulmona, Beneventum-Napies, and Domodossola-Iselle. While only 10 per cent. of the State railways are now electrified, these lines carry 20 per cent. of the total traffic; the employment of electric traction reduced the coal requirements last year by about 600,000 tons.

The telegraph service reported increased business during 1928-29 but the deficit rose from 81 to 85 million lire. Italy now possesses 18,420 km. of submarine cable and a further 10,800 km. is being laid or projected. The annual payment to the State by the telephone concessionnaires has been increased from ½ to 1 per cent. of their gross receipts. One of the principal undertakings of the present administration is the readjustment of the telephone service by laying down an extensive system of underground cables, throughout the whole peninsula, which will join up all the principal towns in Italy, and will also communicate with the chief European cities. The national underground telephone cables will be finished by July, 1931, and will have a total length of more than 1,400 km. The estimated cost of the work is about 520 million lire. During 1929 certain sections were completed, including those between Rome and Naples, Rome and Florence, and Milan and Chiasso.

By a decree of June 13th, 1929, all public and private services carried on by means of fixed and mobile wireless stations were placed under the jurisdiction of the Ministry of Communications Posts and Telegraphs). The Ministry is authorised to operate these stations or to hand them over to private enterprise. The new high-power broadcasting station in Rome commenced to operate during the year, and steps are being taken to improve the programme of the various broadcasting stations in Italy. The situation with regard to interference has improved, foreign vessels within 250 miles of the Italian coast being prohibited from using the spark transmitter on wave lengths between 300 and 450 metres. A more strict surveillance of wireless land stations has also been instituted with satisfactory results to broadcasting services.

Horticultural Congress.

Botanists, cultivators, and market gardeners from all over the world began on August 7th a week of lectures, discussions, and exchanges of experiences at the ninth international congress of the Royal Horticultural Society in London. A Government reception was held at Lancaster House where the guests were received by the Minister of Agriculture and Mrs. Addison. How the growth of tomatoes and cucumbers may be accelerated, and the health and flavour of those vegetables improved, by the electrical heating of glass houses and the use of electric heating cables in the soil of hot-beds were described by British, Norwegian, and German horticultural research growers.

Swedish Electrical Exports.

The Statistics for 1928 and 1929 Compared.

THE following tables, based on the recently-issued Swedish trade returns, compare last year's electrical exports with those for the preceding year, showing the increases or decreases. Details of the principal destinations are also given. The increasing trade with Soviet Russia is an outstanding feature of the statistics.

	1928. 1,000 Kronor.	1929. 1,000 Kronor.	Inc. or dec. 1,000 Kronor.
Cells and batteries—			
Total	2,754	2,759	+ 5
To Great Britain	30	21	− 9
,, Norway	305	323	+ 18
,, Austria	158	90	− 68
,, Soviet Russia	1,306	881	− 425
,, Japan	106	71	− 35
Wireless apparatus—			
Total	2,074	3,131	+1,057
To Norway	77	140	+ 63
,, Denmark	270	639	+ 369
,, Finland	501	304	− 197
,, Germany	121	80	− 41
,, France	25	38	+ 13
,, Spain	16	29	+ 13
Electrical generators and motors weighing each: Not more than 50 kg.—			
Total	6,831	4,840	−1,991
To Denmark	147	32	− 115
,, Netherlands	232	69	− 163
,, Great Britain	157	144	− 13
,, United States	64	58	− 6
,, Australia	130	94	− 36
,, France	1,718	630	−1,088
,, Brazil	1,056	1,178	+ 122
,, Argentina	1,129	795	− 334
50 to 3,000 kg.—			
Total	9,378	8,994	− 384
To Soviet Russia	1,898	990	− 908
,, Norway	50	521	+ 471
,, Finland	992	915	− 77
,, Great Britain	590	775	+ 185
,, Spain	400	489	+ 89
,, Argentina	311	265	− 46
,, New Zealand	28	69	+ 41
,, Australia	137	186	+ 49
,, Belgium	255	886	+ 631
More than 3,000 kg.—			
Total	3,504	4,094	+ 590
To Finland	937	319	− 618
,, Belgium	327	309	− 18
,, Canada	853	665	− 188
,, Italy	107	216	+ 109
,, Soviet Russia	824	377	− 447
Vacuum cleaners—			
Total	16,912	9,834	−7,078
Electricity meters—			
Total	9	20	+ 11
To Soviet Russia	2	10	+ 8
Other electrical measuring instruments—			
Total	71	67	− 4
To Japan	22	8	− 14
,, Poland	8	5	− 3
,, United States	6	19	+ 13
Transformers weighing more than 3,000 kg.—			
Total	2,283	1,700	− 583
To Soviet Russia	986	160	− 826
,, Belgium	308	610	+ 302
,, Italy	75	31	− 44
,, Great Britain	286	69	− 217
Electric lamps (metal filament)—			
Total	214	216	+ 2
To Finland	68	57	− 11
,, Denmark	53	66	+ 13
Carbon for electrical purposes—			
Total	386	345	− 41
To Norway	122	107	− 15
,, Finland	60	28	− 32
,, Italy	4	12	+ 8
Starting, regulating and reduction resistances—			
Total	1,204	1,477	+ 273
To Soviet Russia	337	247	− 90
,, Spain	60	108	+ 48
,, Australia	13	17	+ 4
,, Finland	214	192	− 22
Stators, rotors, current collectors, magnet coils, &c.—			
Total	1,095	1,088	− 7
To Norway	20	202	+ 182
,, Finland	25	44	+ 19
,, Great Britain	178	84	− 94
,, Soviet Russia	52	60	+ 8
Oil-break switches (hand)—			
Total	730	677	− 53
To Soviet Russia	454	245	− 209
,, Spain	17	35	+ 18
,, Great Britain	13	2	− 11
,, Finland	48	75	+ 27
Other switches—			
Total	459	332	− 127
To Finland	74	42	− 32
,, Soviet Russia	122	61	− 61
,, New Zealand	16	2	− 14
Safety appliances, mounted or not—			
Total	562	550	− 12
To Finland	61	89	+ 28
,, Poland	47	51	+ 4
,, Netherlands	23	84	+ 61
,, British South Africa	36	42	+ 6
Telephone apparatus—			
Total	3,264	2,789	− 475
To Finland	341	303	− 38
,, Poland	487	293	− 194
,, Netherlands	414	396	− 18
,, Spain	59	76	+ 17
,, Mexico	215	353	+ 138
,, Argentina	456	463	+ 7
,, Egypt	12	17	+ 5
,, British South Africa	184	81	− 103
,, China	81	259	+ 178
Telegraph apparatus—			
Total	10,521	11,360	+ 839
To Finland	379	387	+ 8
,, Poland	1,243	3,142	+1,899
,, Netherland	2,010	1,344	− 666
,, Spain	48	50	+ 2
,, Egypt	89	193	+ 104
,, British South Africa	197	288	+ 91
,, Mexico	905	2,252	+1,347
,, Australia	23	14	− 9
Cable and wire (metal sheathed)—			
Total	2,766	3,231	+ 465
To Poland	408	385	− 23
,, Finland	119	533	+ 414
,, Mexico	912	619	− 293
,, Argentina	567	636	+ 69
Cable and wire insulated with textile materials, paper, varnish, &c.:— *Diameter of wire not more than 0.5 mm.*—			
Total	476	478	+ 2
To Great Britain	54	12	− 42
,, Denmark	47	38	− 9
,, Poland	54	82	+ 28
,, British South Africa	62	50	− 12
Do., greater than 0.5 mm.—			
Total	350	406	+ 56
To Mexico	9	—	− 9
,, Netherlands	28	28	—
,, Finland	39	54	+ 15
,, Soviet Russia	201	180	− 21

The Stockholm Exhibition.

Some Notes on the Electrical Features of the Farming Section which was held in June.

(COMMUNICATED.)

IN connection with the Stockholm Exhibition, which was opened in May and is to run to September, a special agricultural display, similar to the English Royal Agricultural Show, was made for a period of one week in June, and a section was devoted to the display of electricity on the farm. During the six days that this section was open, some

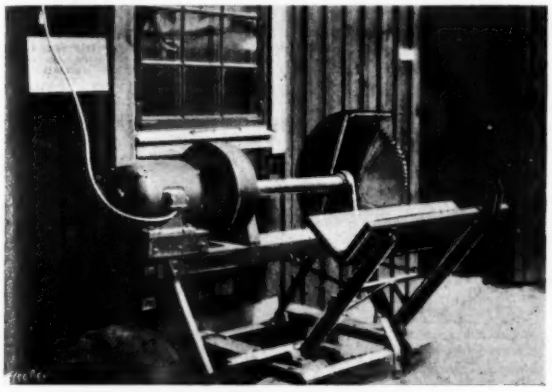


Fig. 1.—Semi-portable Saw Bench.

28,613 persons visited the exhibition. For this purpose a complete set of farm buildings had been built, including a dwelling house, bath house, washhouse, and a workshop.

The house was fitted with lighting and heating points, and in addition to the standard wood or charcoal kitchen stove there was an electric cooker by the A.S.E.A. Co.; this was supplemented by a separate hot cupboard, with 3-heat control. There were separate motor-driven egg and dough whisks, an ice-cream machine, a refrigerating cabinet, and a 5-gallon low-loading water heater, thermostatically controlled, but with an auxiliary 1,000-W boosting element. The washhouse contained an electric washer and an electric iron, while the adjacent fitting shop was equipped with, among other tools, a small semi-portable circular saw directly driven by a 3-h.p. motor, fig. 1. The Swedes being mechanically inclined, it is usual to find some sort of fitting shop on practically every farm.

The supply of cold water for the dairy and farm generally was available under an automatic pressure system in which was incorporated a centrifugal pump directly driven by a 1-h.p. motor. Hot water was provided in the dairy by a 5-gallon "Alfa" water heater of 350 watts capacity, thermostatically controlled, with an auxiliary 1,000-watt boosting element. A 3-h.p. motor drove a light line shaft from which the following machines were belt driven: "Alfa-Laval" new-type electric milking machine; port-hole-type ventilating fan; milk-churn agitator for cooling purposes. In the last-mentioned apparatus the milk churns were suspended in a large concrete or steel tank of cold water and given a semi-rotary motion. Around the whole cow byre was fixed a runway from which was suspended a combined "Electrolux" vacuum cleaner and a separately-driven rotary brush which could be moved to any part of the building for grooming the animals.

In the central portion of the barn, between the stables and cow byre, a 5-h.p., 3-phase motor drove, *via* a short length of shafting, a portable ensilage cutter. Owing to the outfit being on the upper floor the fan driven from the same shafting had only half the usual lift to the top of the silo.

There would appear to be no doubt that the installation of a large corn-drying plant added to the difficulties of setting out the normal machinery, as a cake breaker, a corn-grinding mill of the horizontal-plate type, with vertical drive, an artificial manure or seed-mixing machine, and a seed cleaner were all in evidence, but were not connected up for operation. The corn-drying machine was claimed to be the first of its kind to be marketed, and the elevators and large fan required for this plant were belt driven through shafting by a 5-h.p. totally-enclosed motor. The drier occupied the ground and first floors, and grain placed on conical trays through which air was blown was dropped, when dry, from one section by hand-operated mechanism to the hopper at the bottom, then elevated by a small conveyor to the top of the next section, so that it was perfectly dry and ready for the granary when it left the fourth or last section. The motor also drove a seed-sorting plant. The threshing machine was a standard portable 30-in. model, and in order to show the working in slow motion it was driven by a 3-h.p. variable-speed, 3-phase motor giving a ratio of 930/65 r.p.m. The disposal of the chaff was taken care of by a fan belt-driven from the threshing machine, and the sheet-steel pipe line was fitted with patent quick making joints for easy erection and dismantling. To the Englishman used to large travelling threshing machines, the small 1.5-ft. threshing machines of Sweden appear as toys, but there were many of this size in the exhibition, and the majority of the farms have their own machines. In the small thresher the sheaves are fed in lengthwise, and the separation of the chaff is very poor, hence the need for the grain cleaners afterwards. In this section was seen an excellent little sack hoist capable of lifting 125 kg. (2½ cwt.) by means of a wire rope. The ¾-h.p. motor was self-contained in the hoisting mechanism, and the control for starting, stopping and reversing was carried out by a suspended switch of an enlarged pear type.

In the hen house were a 240-egg size electrically-heated incubator and a large electrically-heated "hover" incorporated in which was "violet ray" apparatus.

There were three electrically-heated pig sties in use, and a fourth was shown in sections to depict the construction of the sty and the disposition of the heating elements. There was a bottom layer of rough concrete, then a layer of charcoal, serving as a heat insulator, and then the final layer of concrete in which the heating elements were embedded. The charge for electricity for heating the pigsties is understood to be about 0.4d. per kWh. A 10-gall. pig-food electric boiler was in evidence.

A field milking installation comprised three open-type, but roofed, wooden stalls equipped with "Alfa-Laval" pipe-line milking plant driven by a 1-h.p. electric motor. A portable 14-h.p. motor was shown complete with starter, centrifugal clutch, pulley, and trailing cable mounted on a carriage equipped with shafts for a pony, and a similar carriage on which was mounted a 30-kVA, 6,000/220-volt 3-phase transformer complete with flexible h.p. trailing leads, at the end of which was fixed a h.p. isolator switch for making the temporary connection to the supply line and also the isolating pole. The l.p. side comprised a 60-A 3-phase switch plug and a wattmeter, the whole being enclosed for weather-proofing purposes in sheet metal.

Electricity was supplied to the farm by means of h.p. underground cables to a rural-type of kiosk sub-station, made by the A.S.E.A. Co., and, instead of being taken from one central distribution point, cables were looped round the outside of the building to ironclad switchgear distribution boxes fitted outside the various sections. Wiring between the starters and motors was in tubing, but internal wiring was in round multi-core hard-rubber braided cable in wood cleats.

A visit was paid to the Stockholm Corporation Experimental Gardens which are situated outside the City and cover several acres. Very considerable experiments are carried out with electrically-heated soil beds, fig. 2, and they have proved satisfactory, based on current at about 0.3d. per kWh. Experiments are carried out on a large scale, and the following beds are among those permanently fitted for this work:—9 beds 4 ft. 6 in. wide by 75 ft. long, 7 beds 4 ft. 6 in. by 60 ft., and 5 beds 4 ft. 6 in. by 60 ft. There is also one large square plot, while experiments in glass houses are also made. The low-pressure supply at 127 volts is obtained from a sub-station situated in the centre of the gardens adjacent to the beds.

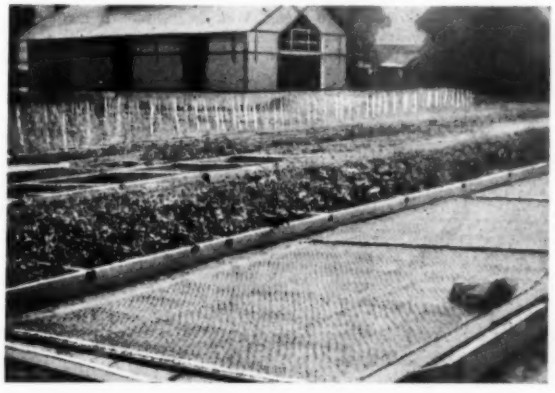


Fig. 2.—Electrically Heated Soil Beds.

Flue Dust and Grit.

An account of the systems in use for flue-dust extraction, coal-riddlings, conveyance, and grit catching at Deptford West and Croydon power stations.

ONE of the major claims for the social advantage of a wide-spread use of electricity is the reduction this would effect in atmospheric pollution. The atmosphere of Great Britain is said to allow, when clean, a remarkably high penetration by beneficial rays from the sun, but pollution of the atmosphere in areas containing by far the greater proportion of the population prevents our taking full advantage of our healthy, though much abused, climate. Moreover, it has been estimated that, in one way and another, dirt in the air costs us about £50,000,000 annually.

The subject of atmospheric pollution has been referred to many times in the ELECTRICAL REVIEW, for instance, in the issue of May 23rd last. It is generally agreed that the domestic coal fire makes the greatest contribution to the fouling of the air we breathe; 40 million tons of coal are inefficiently burned per annum in homes, as against less than 10 million tons in the production of electricity under relatively efficient conditions.

There are those who contend that the use of one chimney instead of many is not necessarily to the public benefit, since concentration of emissions may be more disastrous in their local effects in a populous neighbourhood than the dispersed smoke from thousands of household altars. We know, on the other hand, from the recent trouble at Barton, that the choice of a power station site in open country may bring its own particular troubles. Possibly recent litigation over Barton and the agitation against the Battersea site may, by the stimulus given to investigations, prove to have been disguised blessings. Emissions from power stations may be divided into two classes: (1) grit and dust, and (2) sulphur. Attention has of late been drawn to the second, partly on account of the Barton case, and partly on account of the experiments for the elimination of sulphurous acid conducted at the Grove Road station (ELECTRICAL REVIEW, December 6th, 1929). The work at Grove Road was devised as a large-scale experimental model to anticipate the conditions at the new Battersea station; although the mystery that then attended the transformation of SO2 into SO3 was held not to make the test conclusive, there seemed no good reason to suppose that the results would not be repeated under practical conditions at Battersea or any other large station, provided that the alkalinity of the condensing water were high enough. The kind of chimney emission, however, most noticeable to the ordinary inhabitants of a district is grit, which normally consists of particles averaging about one-thousandth of an inch in diameter. Its avoidance is held to be the easier of the two problems, and one that can be remedied at a cost; it is mainly a question of bringing existing knowledge to bear on the subject, and the appointment by the Electricity Commissioners of a strong committee (ELECTRICAL REVIEW, June 13th, p. 1116) to consider methods in use here and abroad for dealing with the nuisance is a welcome sign of organised effort to utilise existing knowledge.

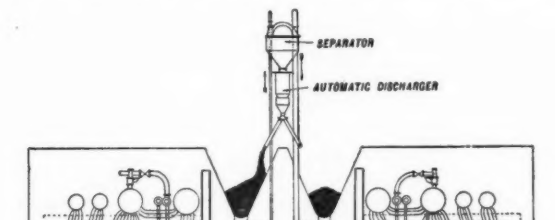


Fig. 1.—Diagrammatic Arrangement of Pneumatic Conveyor.

The first part of Battersea station is to contain 130,000 kW of plant capacity, but it has been designed for an ultimate capacity of three times that amount. If the full development is to be sanctioned, it will be necessary for the first installation to be operated without public offence. The steps taken to deal with sulphur at this station have been referred to above, but there still remains the dust problem. There are two supplementary methods of dealing with furnace dust: one by trapping the soot at an early stage, such as in the boiler itself and its economisers; and the other to catch the particles that have not thus settled before they enter the chimney. For this purpose the London Electric Power Co. has decided to install at Battersea the "Pneuconex" system of grit-catching plant with the attendant apparatus to extract flue dust and to convey soot. This decision was made as a result of satisfaction with the dust-extraction and dist- and riddlings-conveyance plant at Deptford West station, which has been recently started up hard by the original station whence Ferranti started his first high-voltage transmission. Twelve boilers are at present installed in this station, each with an evaporative capacity of 50,000 lb. per hour. For the six "Babcock" boilers with their super-imposed economisers, a flue-dust extraction and conveyance plant is installed, and the riddlings from these and from six Stirling boilers are saved for combustion by the use of pneumatic conveyance to the bunkers. In addition there is a complete system of points for vacuum cleaning the boiler house. The performance of this plant has been good enough to cause the London Electric Power Co. to allow for its inclusion with the next boiler extension and to install "Pneuconex" grit-catching equipment also.

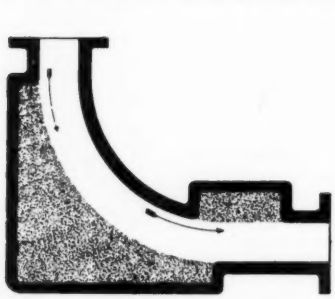


Fig. 2.—Section of Fitting at Pipe-bends.

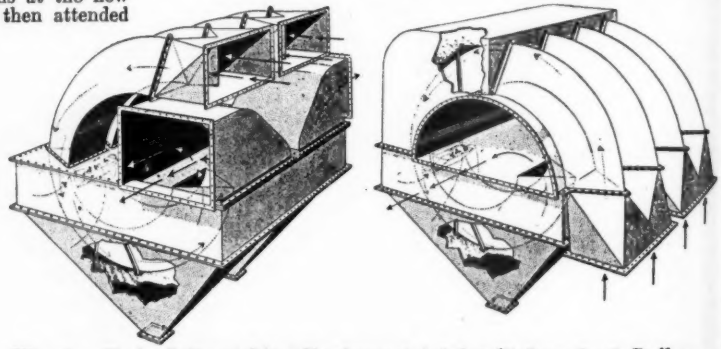


Fig. 3.—Twin Grit-catching Equipment (a) for Stoker-fired Boilers, (b) for Pulverised-fuel Boilers.

The system is pneumatic and automatic, and is most economical in labour, one man being able to attend to the riddlings in two or three hours per day in addition to dust extraction; all work can be carried out with the boilers on load. An ingenious system of valves makes it easy to control the operations of the system when being used for either purpose. The details given in fig. 1 will enable the operations to be easily followed.

The principle of the conveyance system, which has been evolved through years of experience with other materials and after considerable experimenting, is based upon the maintenance of the matter conveyed always in suspension by means of a partial vacuum. The fact that the dust is floated prevents abrasion of the pipes, which can be constructed of light mild steel, except at points at which the direction of flow is changed. At bends in horizontal runs, the type of m.s. fitting shown in fig. 2 is used; the deposits in the angular recess offer a protective cushion, and to avoid wear on the inner side of the circumference, due to ricochet, the second smaller pocket is provided on the opposite side. At directional variations in vertical runs, the brunt is borne by heavier cast-iron detachable backs. To ensure air-tight joints, rings of asbestos and rubber composition are used. The conveyance of coal riddlings to the bunkers overhead is by means of 6-in. pipes running vertically for 130 ft. Before passing to the bunkers the riddlings are sent through a cyclonic separator, which extracts the dust from them. The residue thus recovered has a serviceable appearance, but no analysis of its calorific value is available to serve as a guide to the efficiency of the separators.

The vacuum normally required is about 9 in. Hg, but it is reported that 12 in. is obtained under some conditions of working. This vacuum is created by two rotary exhausters driven by 60-h.p. variable-speed motors made by the Lancashire Dynamo & Motor Co., Ltd., situated in the boiler-house basement (one for each set of boilers), although one exhauster can, if necessary, deal with the dust and riddlings output of the entire station. The air from the exhausters, which appears to be thoroughly cleaned, is discharged to atmosphere through adequate silencers. The plant at Deptford West certainly seems to justify the claim advanced for clean and quiet operation. Some of the external cleanliness is no doubt to be attributed to the vacuum-cleaning arrangements already referred to, but much is evidently due to the closed system of conveyance from the flues. The dust from the rotary separator is usually dropped into the ash sluice outlets; alternatively it may be run into trucks.

Whereas at the Deptford station experience with pneumatic conveyance has led to the adoption of grit-catching plant, the opposite sequence has occurred in Croydon power station, where the solution of the grit-emission trouble by this system is being followed by the installation of "Pneuconex" pneumatic conveyors for the whole boiler house, present and projected (six-100,000 lb. boilers). Croydon power station is unfortunately situated in one respect in that the prevailing wind is from the station to the town, but since the installation of the grit catchers, complaints, once frequent, are said to have entirely ceased. The "Pneuconex" grit catchers are cyclonic in principle, but centrifugal force is assisted by gravity, so that reduction in gas velocity at light loads increases the importance of gravity, which is claimed to counterbalance the loss in efficiency due to reduced velocity. The construction of the grit-catchers is shown in fig. 3. The solid matter in the gases is thrown towards the periphery of the circular chamber, owing to its relatively high specific gravity, and drops through the opening in the periphery (20 ft. in length) into a chamber beneath. The grit catchers are placed on the flue side of the induced-draught fans. It is, of course, difficult to estimate closely the efficiency of grit-extraction plant, but the indications are that between 90 and 95 per cent. of the flue dust passing to the grit catchers in the direction of the chimney is trapped.

Unfortunately the tons of dust made available by the systems described have no commercial value.

The whole of the conveying and grit-catching plant described above has been designed, manufactured, and installed by Pneumatic Conveyance and Extraction (1929), Ltd., who have also, among other important contracts, installed grit catchers for Liverpool, Barton, Glasgow, Calcutta, Wimbledon, Ipswich, and flue-dust or riddlings conveyance for the L.C.C., Greenwich, Kyushin Electric Railways, &c.

Litharge and Glycerine Cement.

This cement, if properly made and mixed, is excellent for fixing switchgear parts. The best way to mix it is to place some litharge on a glass plate and gradually add glycerine, mixing the two together until a mixture about the consistency of a thick cream is obtained. The cement is then ready to apply to the work, and will be found to set fairly quickly.

A disadvantage of this cement is that it is subject to swelling over a period of years, owing to its absorbing CO_2 from the atmosphere. To prevent this, it should be painted with a good waterproof varnish. This cement cannot be used under oil.

International Kinema Patents.

A working agreement between American and German producers.

By C. M. R. BALBI.

THE representatives of the German and American electrical and film industries who have been negotiating during recent weeks in Paris have concluded an agreement providing for the exchange of patent rights and technical information throughout the world. The arrangements agreed upon make it possible for motion picture producers of all countries to obtain licences to produce pictures in all countries of the world under both German and American patents, and provide for the interchangeability of motion pictures in all countries and of all makes of licensed apparatus of the parties. This means that American producers can now enter the German market and German producers can now enter the American market with their productions. As regards the manufacturing and sale of apparatus the German and American interests have made an arrangement for a complete interchange of patent rights and manufacturing and technical information.

Under the arrangements the apparatus required in the following countries will be made in the German factories:—Germany; Central Europe, except Poland; Scandinavia; Switzerland; the Netherlands and the Netherlands East Indies. Similarly, the apparatus required in the following countries will be made in the American factories:—The United States of America, its territories and possessions; Canada and Newfoundland; Australia and New Zealand; Straits Settlements; India; and Russia. The apparatus required in other countries of the world will be made both in the American and German factories.

It should be understood that the arrangements made are not exclusive to American and German interests but are available likewise to the interest of all other nations, the purpose being to provide for the widest possible use of patent rights and technical information controlled by the German and American interests. These interests seek the world-wide development of the talking motion-picture industry.

Much of a portentous nature has been taking place behind the scenes during the past year in connection with the future of the talking-film industry, and even the electrical industry may be surprised to learn that the biggest deal that the world has ever known has culminated as the result of the lengthy negotiations in the details which have been set forth in the above official statement.

When America summoned up courage to launch talking pictures on the world (and made a success of it) other countries began to consider what part they could take in this field. In England, as we learned to our cost, the exploitation of talking pictures took place in all directions; hundreds of mushroom companies were floated during the boom, and in many cases not a single film was produced to show for the money that was poured into them by the British public.

In Germany, however, the line of action taken was different; active business men proceeded to gather together and pool all the inventions they could procure that were of importance, notably those of Engl, Vogt and Massolle, and under the organisation known as the Klangfilm Co. When the work was complete negotiations were initiated by a delegation from the Western Electric Co., which sailed from New York in the spring of 1929 to meet the representatives of the Klangfilm Co. in Germany, which it was found was in a strong position to press its claims.

As is so often the case, one may conclude that the initial terms on either side were more than either party was prepared to accept, but nevertheless it is evident that the Americans were so impressed with the strength of the German party that they in their turn invited representatives of the Klangfilm Co. to America about a month later to try to bring about a settlement; the delegation arrived in New York about June. No agreement was arrived at, however, and a trial of strength took place over the Von Lieben valve patent in which the Germans won, and won again on appeal.

From this point onwards, while apparent preparations were being made for a gigantic fight for supremacy in the talking-picture field, negotiations were afoot to amalgamate the interests concerned with such complete success that we may now look forward to vast strides to the improvement of the "talkies" owing to the treaty which has been concluded.

England has never been lacking in able inventors and pioneers. As I pointed out in my recent articles on "Talking Pictures" (see p. 1145, June 20th, 1930) she could have acquired Mr. Eugene Lauste's master patent in 1906 and led the world, instead of being in the position she is in to-day with regard to talking pictures, but matters being as they stand it would seem that, if England is ever to take her place in the talking-picture sphere, it will be necessary for her business men first to strengthen their position and then to follow Germany's lead and demand her rightful place in the amalgamated world industry which the agreement represents.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

New High-temperature Electrical Resistances.

The difficulty of employing metallic conductors as resistances at high temperatures, without exposing the wire to the air for the purpose of dissipating the heat generated, resulted in attempts being made to surround the wire with insulating compounds, but difficulties were experienced owing

Fig. 1.—Construction of "Pantohm" Resistance.

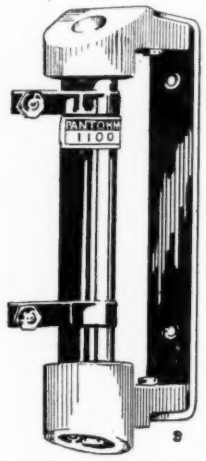


Fig. 2.—The "Pantohm" Traverse.

to the compounds being brittle or hygroscopic, to their having higher coefficients of expansion than the conductors, and to the formation under increased temperature of silicates or sulphates. All the above drawbacks are, it is claimed, eliminated in the new "Pantohm" resistances introduced by Steatite & Porcelain Products, Ltd., Stourport, Worcestershire. Fig. 1 shows the construction of a "Pantohm" resistance, which is as follows: a high-quality resistance wire, which is homogeneous and not liable to break, and which undergoes no structural alterations when heated to 1,000 deg. C., is wound on a ceramic body, and is subsequently glazed by a special process at a temperature of 1,000 deg. C. The glazing completely embeds the resistance wire, protects the unit from all mechanical and chemical influences, and prevents its movement. Due to this intimate combination of the glazing with the resistance wire, the whole surface of the unit is utilised for dissipating the heat produced by the current, and the resistance can, therefore, be subjected to much higher loads than the older types. A special process (for which patents are pending) of making contacts is adopted in the manufacture of the resistance. A ring of solder, melting at a definite temperature, is placed under the winding at the point at which the connecting clip or the stranded wire is secured. During the baking process, the solder flows out, surrounds the resistance wire, and at the same time combines intimately with the clip or the stranded wire. This makes the contact absolutely independent, it is claimed, of outside influences. Tests have shown that the resistance does not vary even at a pressure of one-ten-thousandth of a volt.

For h.p. work models have been produced in which the length of winding is the same, but with the ceramic body extended in the axial direction, so that the disruptive strength has been considerably increased, amounting to about 30,000 volts. A "Pantohm" dwarf resistance has been designed for low loads such as are usual in potentiometers, for telephone and telegraph engineering, in switchgear, &c. The resistances can be supplied with the following type of terminals: clip, stranded-wire, stranded wire with contact lugs, clamp, and also with tappings. "Pantohm" resistances are best suspended vertically, but this must be done so that the hot air can escape freely upwards without any impeding of the natural ventilation, as, for example, by caps which cover the resistances. The "Pantohm" traverse, fig. 2, fully meets these requirements, and it can be supplied for fitting one or two resistances clamped between steatite sockets and held in position by springs, thus making them easily interchangeable and protecting them from shocks. "Pantohm" traverses can also be supplied with a perforated sheet-metal hood.

A Lubricant Steriliser.

A considerable amount of attention has recently been given to the septic-poisoning problem in workshops. One of the most common causes of infection is by means of the cutting oil used on automatics, and the problem of sterilising the oil and freeing it from disease germs during its long period of use has presented numerous difficulties. Ordinary antiseptics, such as carbolic acid, have proved, it is claimed, to be inert in oil unless added in large quantities, but this has a detrimental effect on the operator's skin. After many months of research a new powerful antiseptic, "Dibactol," has been perfected by Messrs. Alfred Herbert, Ltd., Coventry, in collaboration with a firm of manufacturing chemists, which, it is claimed, effectively sterilises the cutting oil used on machine tools. An addition of only 1 per cent. of "Dibactol" is sufficient to destroy all harmful germ life, particularly that virulent form of bacillus known as "staphlycoccus aureus," and it has no harmful effect on the operator's skin. The preparation is self mixing, and it can be added to the cutting oil, either in the storage tanks or in the machine. A further feature is that during the centrifugal process, temperatures up to 140 deg. F. cause no loss of "Dibactol" through evaporation nor affect its efficiency.

Eddy-Current Brake for Trolley 'Buses.

We have received from Agricultural and General Engineers, Ltd., Aldwych House, Aldwych, W.C.2, some particulars of the "Bull" eddy-current brake, fig. 3, developed by Bull Motors, Ltd., for use on electric trolley 'buses and other vehicles. The brake is claimed to be very simple to operate, to call for the minimum effort on the part of the driver, to be noiseless in operation, and to be smooth in action. Briefly stated, a short-circuited steel rotor is mounted on the motor shaft and rotates within a specially designed field-magnet frame. Braking effort is obtained simply by exciting the field, which thereby induces currents in the rotor itself, these currents reacting upon the field magnetism to bring the motor to rest. The braking power is entirely dissipated within the rotor as heat, cooling air being drawn by a fan past fins on the rotor to keep the motor temperature within safe working limits. The field excitation does not exceed 1 kW. The brake is operated through a controller actuated by the footbrake-pedal, and is effective down to a speed of 3 m.p.h. After it has been operated fully a further depression of the pedal brings the friction brake into action for complete

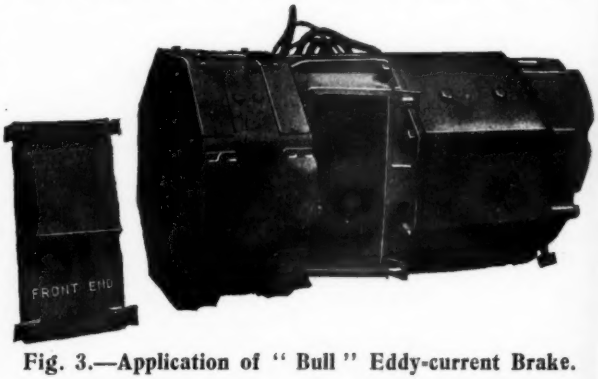


Fig. 3.—Application of "Bull" Eddy-current Brake.

stopping or emergency. The ordinary friction brake is thereby relieved of all duty except that of actually stopping the vehicle, and the life of the lining is prolonged, it is claimed, by about 200,000 miles.

Long 66-kV Transmission Line.

What is said to be the longest distance transmission of electric power at 66,000 volts was recently established by the Central Power & Light Company when, by the completion of a transmission line connecting Laredo, Tex., with the company's Gulf Coast district at Robstown, *via* Falfurrias, electricity was first transmitted from the company's generating plant on Devil's River, Del Rio, through the Winter Garden and Laredo districts to Robstown and beyond, a distance of 362 miles.

The Brussels Congress.

Provisional Programme of Sessions of the Third Biennial Meeting of the International Union of Producers and Distributors of Electrical Energy, to be opened on September 4th, 1930.

THIS year Belgium celebrates the centenary of its independence, and the occasion is being made use of by many international associations to hold their conferences in that country.

Among such conferences is the Third Congress of the Union Internationale des Producteurs et Distributeurs d'Energie Electrique, for which arrangements are being made by the Union des Exploitation Electriques en Belgique.

Four of the eleven days (September 4th-14th) of the Congress will be devoted to technical sessions, the remainder being reserved for visits to the exhibitions at Antwerp and Liège, to important industrial works, and to excursions to the coast and in the Ardennes. Members and their friends will also be entertained at various functions, and a complete social programme has been drawn up for the enjoyment of those not attending the technical sessions.

The opening session on September 4th at 3 p.m. will take place at the Palais des Académies, Brussels, when the Minister of Public Works will preside. This will be followed by a lecture (illustrated by kinematograph) on "The Modern Power Station" by M. L. Herry, Administrative Director of the Flanders and Brabant undertakings, at the Residence Palace, Rue de la Loi, at which building the technical sessions will take place.

It has been arranged that the following papers shall be delivered by the authors and on the dates given :—

September 5th.—Recent Progress in Steam Power Station Construction—Emissions from Power Stations (M. Herry); New Station of the Chade at Buenos Aires; Frequency Standardisation (M. Dickmann); New Plant at Issy-les Moulineaux (M. Dessus); Grouping of Stations in Iron and Steel Works in the Briey Valley (M. Evain); Frequency Standardisation in the Paris Region (M. Rieunier); Recent Progress in the Construction of Large Steam Stations in Italy (E. Cesari).

Technical Conditions Involved in the Parallel-running of Stations (M. Niesz); Running Stations in Parallel in Lorraine; Paralleling Large Systems (A. Roncaldier); Technical Conditions of Parallel Running (J. Ibler); Continuity of Supply (M. Uytborck); Selective Protection (A. Jonnart); The Need for Statistics Relating to Operation Irregularities in Power Stations (M. Nacholinski); and papers dealing with continuity of supply in Vienna, Belgium, France, Holland, Switzerland, and Czecho-Slovakia.

September 6th.—Neutral Earthing in High- and Low-Voltage Systems (U. del Buono); Neutral Earthing on the 65-kV System in Lorraine.

Co-existence of Power and Telecommunication Lines (M. Brylinski); Measurement of Noises due to Induction and Determination of Admissible Limits (M. Garczynski).

Lighting Propaganda (M. Imbs).

Safe Voltages (M. Lohr); Safe Voltages for Electric Currents (M. Feraud).

September 9th.—Publicity Among Consumers Regarding Applications of Electricity (M. Straszewski); Lighting (M. Boulard); Rural Electrification in Belgium (M. Sohie); Publicity Work by Belgium Distributors (M. Sohie); Lighting at the Barcelona and Seville Exhibitions: Tendencies in Publicity (M. Sartre); Developing the Domestic Load (M. Antoine); Publicity by a Distributing Company (M. Groslier); Low-voltage Rural Networks (M. Bitouzet); Accidents with Low-voltage Overhead Lines (M. Polack); Commercial Organisation for Developing Consumption (M. Pinard); Electric Vehicles (M. Vincent); Propaganda in Japan for Promoting the Use of Electric Light; Electric Heating in Dutch Schools; New Applications of Electricity to Agriculture in Holland; Propaganda in Poland (C. Zakiewicz); Publicity in Lodz, S.A. (Prof. E. Ulmann), Propaganda among Consumers and the Progress of Lighting (A. Burri); Diversity in Use in Lorraine.

Meter Testing (Prof. H. S. Hallo); Maintenance of Meters (M. Derdeyn); Limits of Precision of High-voltage Metering (M. Rennesson); Metering Organisation of a Large Electrical Undertaking (G. Fracanzani); Metering Organisation in Power Stations (B. Jablonski); Official Regulations as to the Testing and Certification of Meters (J. Rzasnicki); Testing and Maintenance of Meters (P. Masa).

September 10th.—Tariffs in Belgium (P. Chaudoir); Effect of Power Factor Tariffs on the Technical and Commercial Operation of Electrical Installations (G. Fracanzani); Standard Tariffs in Poland (M. Altenberg); Graphic Methods of Presenting and Comparing Tariffs in Prague (H. Melzer).

International Statistics of Production and Distribution of Electricity (M. Ganguillet); Principal Characteristics of Production, Transmission and Distribution of Electricity (W. Konczykowski); International Statistics (V. List).

Comparison between Net Cost and Selling Price of Electricity for Lighting (M. Brylinski).

The Lighting of Lynn.

(From the "Electrical Review" of September 15th, 1899.)

"A MERE glance at an ordinary railway map of Norfolk brings home to the mind of the electrical engineer who is acquainted with the course of electric lighting progress in this country what a small amount of such work has, so far, been accomplished within the county. We think of the attempts made by a company to light Thetford, attempts which were not rewarded with sufficient business to allow the continuance of the works, which consequently came under the hammer a few years ago. We think of Cromer, the fashionable and quiet watering place on the north-east, where, although the electrical engineer has done his best during recent years to bring a scheme to a head, nothing has been actually done. There are Hunstanton, Dereham, and a host of other towns, where the electrical engineer has yet to find his way, and this he will probably do within the next few years.

"The Municipal plant at Great Yarmouth, with its electric tram scheme now working out, and the electricity supply system of the Norwich Company, are satisfactory undertakings. But beyond these there is practically nothing to speak of, for the county consists of some scores of small villages or towns, the largest of which can boast of only 3,000 to 5,000 population—a population which varies, we should think, very little indeed in the course of the year, save in the case of the more prominent holiday resorts on the coast.

"Electrical engineers are so fully occupied with large lighting, traction, and power schemes just now, that it may be thought to be hardly worth the candle at the present moment to consider the numerous small districts throughout the country. When the needs of larger towns have been attended to, however, the question of electric lighting must be eventually raised, unless gas or oil is for ever to hold sway. There is, of course, the very important question arising as to whether it would pay at all to introduce electric lighting by a public installation into these small scattered, and by no means wealthy, districts, until the costs can be reduced to a lower figure than at present. We imagine that the most likely way in which it may be arranged will be for the Yarmouth, Norwich, and Lynn, and any other of the larger works to distribute current for meeting the needs of the adjacent smaller places, unless small isolated gas-driven plants can be put down.

"In the preceding remarks we have not made particular reference to the town of Lynn, or King's Lynn, the population of which is somewhere between 18,000 and 20,000; this fact bringing it outside the category mentioned. There seems to be a good future in store for electric lighting here."

[In view of the rural developments in the county of Norfolk that have been much discussed in the daily Press during the past week, the foregoing notes may be of interest as representing an attempt of more than thirty years ago to visualise the future of electricity supply in that area under the influence of prevalent ideas and the actual practice then current.

The notes were written by the writer of the present paragraph (our Commercial Editor) at a King's Lynn hotel, with maps before him, the night before his visit to the borough electrical engineer, Mr. Pilling, and they formed the introduction to a fully illustrated article describing the undertaking (gas producers and small gas engines). Eds. Elec. Rev.]

Electrical Accidents in France.

Consequent on the increasing employment of electricity in France and its introduction into rural districts, a considerable amount of research work is being devoted to the causes of electrical accidents and their effect on the human body. An article in the *Révue Générale de l'Electricité* of June 8th refers particularly to this subject, and states that the principal danger in connection with electrical accidents is said to be a stoppage of the heart. When an alternating current exceeding 50 to 100 milliamperes passes through that organ its action ceases after an interval of a few seconds. When attacked by a weaker current, whether passing through the heart or not, asphyxia may be produced within, say, 15 minutes. The victim may be restored to normal conditions by the methods employed in cases of drowning, but when a current of the magnitude indicated has traversed the heart death is instantaneous. Strange and still unexplained is the fact that currents of much greater intensities do not stop the heart's action, but permit the victim to be restored as explained above, the difference being that large currents produce burns, varying in their gravity and character.

In order to reduce the number of accidents which occur in France from these causes the Minister of Public Works has created a "Committee for the Prevention of Electrical Accidents," composed of representatives of the various Ministries more or less concerned with electricity, with the addition of representatives of the generating companies and members of their staffs.

Reviews.

The Commutator Motor. By F. J. Teago, D.Sc., M.I.E.E. Pp vii+80. London: Methuen & Co., Ltd. Price 2s. 6d. net.

The ground covered by this little book is more restricted than is implied by the title, and a more accurate description would be one indicative of the control of the speed of three-phase motors by the use of commutators. In the first chapter the author deals with the question of the speed control of three-phase a.c. motors from the point of view of fundamental principles, and shows how, in an ordinary induction motor, speed control is obtained by absorbing energy in the rotor circuit, and how the addition of a commutator to the rotor enables the required speed variation to be obtained more efficiently, in that energy can be taken from or delivered to the rotor at the normal supply frequency. Two elementary chapters then follow, dealing, respectively, with the production of a rotating field by means of an a.c. polyphase supply, and with the causes of low power factor in ordinary induction motors. In this latter chapter the author does not make at all clear the ordinary objection to low power factor. He states that it is no solution to the problem to connect condensers in parallel with an induction motor, as, although this method improves the power factor of the supply, it does not correct an inherent defect in the motor. The notion that an induction motor is defective because it requires a reactive magnetising current seems to be quite a mistaken one. All a.c. motors require such a current, and if this can be economically supplied by apparatus external to the motor, as by static or synchronous condensers, the problem of low power factor must assuredly be considered as solved. As a matter of fact, the inherent property of ability to work at unity or leading power factors, possessed by three-phase commutators, is very rarely a factor of great importance in determining their use. Commutators are generally only tolerated in a.c. motors to obtain speed control. Merely to improve power factor, most engineers would probably prefer to employ extraneous means.

In an important chapter the author is very successful in explaining the method of transferring energy to or from the rotor. We do not think that it is at all self-evident to most engineers that the frequency of the currents from the brushes of the commutator of a three-phase motor is independent of the speed of rotation. A clear grasp of the reason of this important fact is essential for a right understanding of the action of commutator machines, and Dr. Teago might well have devoted a little more space to an explanation of this matter.

Motors of well-known types are then considered in detail, and their speed-regulating and power-factor-correcting properties are very lucidly explained. Two final chapters deal briefly with the cascade operation of commutators, operation as induction generators, and a method of utilising slip power.

There is a valuable appendix in which the author develops in considerable detail the elementary theory of the circle diagram of the plain induction motor, and then continues his reasoning to establish the modified circle diagram for a commutator type of machine. This appendix is sure to be greatly appreciated by engineers.

We have the greatest pleasure in commending this little book. It is an able and lucid exposition of a somewhat difficult subject, in a well-produced volume, published at a very reasonable price. No engineer will regret the modest outlay of half-a-crown necessary to obtain this admirable work.

Electrical Distribution Engineering. By H. P. Seelye. Pp. viii+710; 394 illustrations. London: McGraw-Hill Publishing Co., Ltd. Price 30s. net.

The appearance of a volume dealing exclusively with the theory and practice of electrical distribution as distinct from transmission is not of such frequent occurrence as the importance of the subject warrants, and as a result the non-specialists' ideas on the subject are often of the vaguest.

Broadly speaking, most of the information hitherto published has been in the form of isolated papers in the technical Press or in the journals and transactions of the learned societies, while, in addition, sections on distribution are included in most of the electrical handbooks. The present volume, therefore, is unique in its own sphere inasmuch as it presents a complete survey of all that is involved in the theory and practice of electrical distribution, and, while being confined essentially to American practice, much of what is written is equally applicable to distribution systems elsewhere. The volume is divided into three parts which deal, respectively, with the electrical design, the mechanical design, and the economical design, these comprising in all 37 chapters. The number of chapters alone will give some idea of the comprehensive character of the work, which is far too exhaustive to review in detail. Broadly speaking, the study may be said to embrace considerations of load characteristics, primary and secondary distribution, distribution transformers, and accessory apparatus such as fuses, disconnecting devices, lightning arrestors, and overhead and underground systems, which are dealt with in considerable detail, while a wealth of useful information is given concerning their varied component parts. In the section on economical design the author discusses the principles involved, which include studies of investment costs, cost of energy losses, and the part these factors play in the problems arising in primary and secondary distribution systems. Considerable attention is devoted to the importance of voltage drop and regulation. The volume is the result of the author's experience during 13 years in distribution engineering with the Detroit Edison Company, and we are under a debt of gratitude to him for having given his brother engineers an opportunity of making use of his wide knowledge of the subject. The book can be recommended most cordially to all those interested in the design and layout of electrical distribution systems, and we welcome it as a valuable addition to electrical engineering literature. It is produced in the well-known McGraw-Hill style, and the price, while appearing high, is not unduly so, considering the high standard of excellence of the contents and of the production.

S.A.S.

Overhead Expense in Relation to Costs, Sales, and Profits. By A. Hamilton Church. Pp. viii+418. London: McGraw-Hill Publishing Co., Ltd. Price 25s. net.

As a result of the present day tendency to replace labour by costly and powerful equipment, cost of production is being withdrawn more and more from the easily visible class of direct expense, and is being transferred to the more obscure regions of overhead. The proper charging of overhead costs to production is accordingly growing much more important. This movement towards mechanisation has not progressed quite so rapidly in this country as in America, but the new approach to the treatment of the overhead problem developed in this book is worthy of the serious attention of all progressive business men.

The book is written with an eye to the production and cost man, but the method of approaching the problem makes the book quite readable for those not directly associated with manufacturing operations.

The essence of the book is the treatment of overhead expenses as the cost of maintaining all the processes of the plant in a state of preparedness for production. Overhead expenses are regarded as an assembly of service factors capable of independent control and allotted to different processes in proportion to the use made of such services. Instead of charging overhead cost to production on a percentage basis or a machine-rate basis, hourly process rates are calculated on the basis of the annual cost of each service factor for the particular process.

The adoption of these rates means that the whole overhead cost is charged to production only when each department is working at 100 per cent. activity throughout the year. The existence of idle capacity thus involves a charge against profits, and only that proportion of overhead really used in production is charged to shop costs.

Through the adoption of this principle, true costs of manufacturing capacity are obtained that are not affected by short-time working. A much closer control of costs is thus possible through standardisation of process rates on the basis of estimates for the year for the factors directly and indirectly representing services to the various processes. The adoption of these principles, it may be noted, involves the operation of budget control in the production department, and necessitates the establishment of standards for operating times and wage rates on the basis of time and motion studies.

The author develops his theme by starting with a survey of overhead in its elementary form in a one-man shop and the determination of service factors under these conditions. He then proceeds to an explanation of the situation arising with a consolidation of several of these one-man shops under one financial control. Having in this preliminary discussion enabled the principles involved to be observed free of all extraneous considerations, he then goes into a more detailed examination of the relations of overhead cost and production and the influence of standardisation.

Finally, he discusses the practical steps in setting up a system of service factors and process rates, together with the control of these standardised rates on a budget basis and their practical adoption in price fixing and estimating.

A. W. W.

Electric Testing Simplified. By H. H. U. Cross. Pp. xv+191; figs. 103. London: Crosby Lockwood & Son. Price 5s. net.

It will, we think, be generally agreed that there is nothing more difficult than to write simply about electricity and electrical phenomena. In this little work, the author, who is well known as the writer of a number of books dealing in non-technical language with certain of the practical applications of electricity, essays to explain the principles underlying the work of the electrician who has to deal in his daily life with the problems of testing. It cannot, however, be truthfully said that he has succeeded completely in his task, because while in certain parts of the book the idea of simplicity is carried right to the limit, with the result that even the elementary schoolboy could grasp the idea it is intended to convey, much more the apprentice and the student who attends evening classes at the technical school for whom the book is intended, in other parts he slips unconsciously into the language of the scientifically and technically trained engineer, as, for example, when in describing the nature of alternating current, he speaks without any attempt at explanation of the sine curve. To the reader who, in the

explanation of Ohm's Law, is assumed to be unable to make the simple mathematical process of cross-multiplication in order to obtain R from the formula I=E/R the sine curve must be surely a thing unknown. And, by the way, if the author bows to convention in writing I for intensity of current instead of C in the more familiar expression C=E/R for Ohm's Law, why does he not go one further and write V for the voltage instead of E the electro-motive force, surely a simpler conception, and write the formula as I=V/R as it is now almost universally given in technical schools? We mention these one or two little inconsistencies merely to indicate how difficult it is to remain throughout true to the purpose of writing simply on any branch of the subject of applied electricity.

As indicating the scope of the work, it may be noted that after his introductory chapter in which he explains the nature of the units employed in electrical measurements, including the presentation of Ohm's Law referred to above, the author proceeds at once to describe the different types of instruments used in electric testing, these including the Megger, the Bridge Megger, the familiar little Meg and the Ohmer. In his description of the Megger he gives an elementary diagram of the component parts, wiring, &c., as well as a diagram of the actual details and their connections, and without any explanations of the former, he proceeds to describe the latter with, we think, not the happiest of results. It is to be regretted that the description and the explanation of the working of this important instrument were not based upon the simpler diagram. He then deals with the voltmeter and the ammeter, including the simpler types of instrument which have become so widely used in connection with wireless sets and the electric lighting equipment of cars. The chapter on meters for special purposes, in which are included, among others, power factor meters and synchronisation apparatus, is hardly called for in a work of this nature as the majority of these meters would only be handled by the more expert electricians in the power station itself. We like the chapters which deal with the actual use of the instruments in making tests, particularly where the author gives the figures which must be expected for different types of machines. Too often the tester has no idea as to the results he should obtain, and in an insulation test for example unless the needle flies to infinity he assumes that things are not what they should be. The testing of industrial dynamos and motors—the latter being obviously of far greater practical value—is satisfactorily dealt with, and in his concluding chapter the author describes the testing of motor-car electrical plant. This is a very useful little chapter and one which should prove capable of amplification in a future edition in view of the extent to which motor cars are being used by persons who have little or no idea of the principles underlying the operation of either the engine or the accessories in which must be included the electric lighting plant, the electric starter, and so on. We might in conclusion, while recommending this book to students, apprentices, and jobbing electricians who are particularly interested in the subject of testing, express a regret that a greater measure of consistency has not been observed in the preparation of the diagrams used to illustrate the text. Some are excellent, but others are very amateurish in their conception as well as in the way they have been drawn.

The 1930-31 Lighting Season.—I.

The British Thomson-Houston Co.'s "Mazda" Campaign.

FOR the last two or three years one of the brightest features in electrical publicity has been the "Dancing Girl" introduced by the British Thomson-Houston Co., Ltd., to draw attention to "Mazda" lamps. The company has wisely decided to make further use of this very attractive young lady as a means of promoting its lamp sales,

Fig. 1.—The "Mazda" Window Display.

and she will accordingly enter into the bulk of the advertising matter issued for the coming lighting season.

This year she will not only be seen in illuminated window displays and on the covers of leaflets and catalogues, but will also appear in three-dimensional form as a statuette.

The central "Mazda" advertisement—the illuminated window display—is this year being supplied in two sizes to suit windows of different dimensions, but apart from size, they are identical and are supplied complete with lampholder, adaptor, and flexible cord. The front portion is printed in red and black, while the recessed portion bearing the "Dancing Girl" design is printed in full colours, and is lighted from the top. The company considers that this is the most effective and attractive of the series of displays which it has issued since the war. The display is illustrated in fig. 1. The new showcard (fig. 2) is very similar to last year's design, with small alterations in the colouring and lettering. It is provided with a cord for hanging as well as a strut enabling it

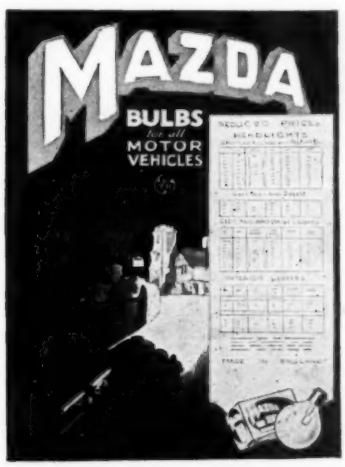


Fig. 2.—Showcard giving Prices.

to be stood on a counter or in a window. It measures 22 in. by 16 in. In addition to the distribution of this card through the ordinary trade channels, it will be exhibited throughout the season in every lift and on every escalator on the Underground Railway system and in a large number of Metropolitan Railway carriages.

A new showcard dealing with "Mazda" motor-car bulbs is available. This card, as in previous years, gives full price information and other details on the front, while on the reverse side is printed a tabulation showing the lighting set voltage and type of bulb cap required for every motor vehicle used in the United Kingdom.

The "Dancing Girl" picture appears on the covers of the various leaflets dealing with Group I lamps. Instead, however, of printing the picture in full colours on these leaflets, it has been produced very effectively in monochrome, relieved by lettering in brilliant red. This applies to the small "Mazda" folder L.504, which can be supplied in quantities to dealers overprinted with their names and addresses; to the quarto size leaflet, also available for overprinting; and to the complete catalogue, in which practically all types of "Mazda" lamps are listed.

The company is now packing all types and sizes of its lamps (with one or two unimportant exceptions) in attractive cartons. These are simple and effective, completely protecting the lamps, and at the same time possessing an attractive appearance. It will in future be possible for a dealer to make a very effective window or counter display of "Mazda" cartons of all types, including tubular, candle, and other special types.

The characteristic note of this season's Press advertising will be a bold simplicity of design. The leading London and provincial newspapers will be included in the campaign, together with a comprehensive list of retail and manufacturing trade papers. A special booklet for the trade only, entitled "BIG in every Respect" will be issued. This booklet, which is of a very attractive character, gives useful information about the "Mazda" advertising campaign, and contains illustrations of the various leaflets and items of display material available.

We propose to deal with the programmes of other leading lamp manufacturers in subsequent issues.

Correspondence.

***Correspondents should forward their communications* as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Electricity v. Gas for Heating.

In the letter appearing under this heading in your issue of the 22nd inst., your correspondent has evidently discovered the approximate relationship between 100,000 and 3,410, but he has entirely overlooked the all-important matter of relative efficiency of the two systems.

The average percentage efficiency of electric heating apparatus is definitely quite double that of gas-heated apparatus, and the only satisfactory comparison is on the basis of useful work actually performed.

If the figure of 30 were divided by two, giving 15 as the factor, we should be much nearer the truth. The comparative cost in Betchworth would then be 13.4d. per therm, as against .9d. per kWh.

In 1913 I was able to make some useful comparisons on this same subject, and the definite conclusion was, with the apparatus then available, that an electric water heater supplied with current at ½d. per kWh produced the same results as a Califont gas geyser supplied with gas at 2s. 6d. per thousand cubic feet, which, at 500 B.th.u. per cubic foot, is equivalent to 6d. per therm.

These figures reduce the factor to 12.

Ch. Hubert Smith.

Norwich, *August 23rd*, 1930.

Dividing 100,000 by 3,410, Mr. Kempe has discovered that the potential heat content of one therm of gas is approximately thirty times that of one kWh, and he claims originality for the simple rule of applying a divisor of 30 to the price of gas per therm in order to arrive at the price per kWh at which electricity must be sold to compete with it. Original the rule certainly is—and simple too—but, for most purposes, it is just as certainly wrong. For some industrial applications of heat the rule may serve very well, but for purposes of domestic heating the rule takes no account of the higher thermal efficiency of electric heating equipment, nor of its greater effectiveness, as measured by radiation efficiency. There are, of course, other considerations too which weigh in favour of electricity, and most electricity supply authorities and many of their consumers too can refute from long experience the suggestion that to compete with gas at 13.4d. per therm, electricity must be sold at less than ½d. per kWh.

R. J. Hebbert.

Manchester, *August 23rd*, 1930.

[Mr. R. W. Kennedy (London, S.W.19) has also pointed out the importance of relative efficiencies as a factor in the comparison. In both the letters printed above 3,410 B.th.u. is given as the heat equivalent of a kWh. There is still considerable diversity in practice in the evaluation of this equivalent, the figure varying from 3,410 to 3,415 B.th.u. The basis was, however, finally fixed at the International Steam Table Conference held in London last year, when the kilo-caloric was defined at 1/860 kWh, giving a value of approximately 3,412 B.th.u.—Eds. Elec. Rev.]

Rural Electrification.

With reference to my article on July 25th, I am much obliged to Mr. Borlase Matthews for his suggestions published in your issue dated August 22nd.

As it happens, I am well acquainted with the Land Improvement Co., having been in touch with it quite recently on the subject of Dutch barns, but I hardly think that in advising landowners to borrow Mr. Matthews is offering sound advice, and I can readily imagine what the landowners in Lincolnshire would say. However, it is useful to know where to go to, if need be.

There is necessarily a great divergence of opinion between those who say what should be done and how to do it, and those who have the doing of it and have to foot the bill themselves; the object of my article was to give a landowner's view, with the idea that the electricity supply industry should have, at first hand, some indication of the difficulties that do occur in practice.

A country landlord has enough to do with purely agricultural work—renovation of cowsheds to conform to modern officialdom's requirements being but one—and after all the outgoings are taken into account, little or no money is left.

It is all the more desirable, therefore, that wiring of premises, &c., should be carried out by the supply companies, who have the knowledge, facilities, and £ s. d. available to do so.

If, as Mr. Matthews suggests, a rent charge were created, it would be a far more difficult task for the landlord to exact it when the present tenant leaves and a new one comes in than it would be for the supply company, and it is here that an amendment to the Agricultural Holdings Act is so urgently needed.

No, it is surely far better for the supply authority to do the work, obtaining the interest and assistance of the owner of the property.

Incidentally, it may interest Mr. Matthews to know that I have just placed orders for the electrification of one of my farms on the lines suggested in my article, *i.e.*, an extra rent based on a percentage of the cost of the wiring, whilst the power equipment is being purchased by me, but actually paid for by the tenant. I have agreed to refund him this amount when he goes, less 10 per cent. of the original cost per annum to cover depreciation, but I am unlikely to be able to do the same for all.

Moreover, it should be noted that, having carried out this improvement, I shall have to pay 22½ per cent. of the rent I receive to the Government by way of tax!

H. C. Wollaston.

London, S.W.5, *August 23rd*, 1930.

Lightning Phenomena.

I read with interest the article on Lightning Phenomena in the July 11th issue of the Electrical Review. The photograph, fig. 5, in this article is surely misinterpreted. I refer to the statement about the ultra-red light photographing black against the sky. I fail to see how this can be, since photographic action depends on light, visible or invisible, acting on the emulsion which, when developed, produces density greater than when no light has acted.

To produce dark lines against the sky, therefore, the emulsion must be shielded against action of the light from the sky during part or the whole of the exposure. The most probable explanation of the phenomena is that the flash producing the black lines was of very high intensity, probably in the violet end of the spectrum (unless Mr. A. N. C. Horne used Pancro plates with a heavy screen, which is unlikely, judging by the clock face and street lights), and the image reversed when developing, due to great over-exposure and over-development. In any case, ordinary emulsions are very insensitive to the red end of the spectrum, so that red light would have no effect anyhow.

Figure 4 is most interesting. How about some wireless enthusiasts snapping the "static" that reduces them to profanity and so obtaining a picture of that demon which may help them to lay him?

W. D. M.

Tokio, *August 9th*, 1930.

An Advertising Matter.

We note that a certain firm of electric motor manufacturers claims in the advertisement pages of your issue for August 15th to be "the only firm in Britain manufacturing Repulsion Start Induction Motors."

We should like to point out that this is not the case. We placed a line of repulsion start induction motors on the market in the autumn of 1927, and have been selling motors of this type both in England and in various British Dominions ever since that date. Our motors are made entirely in England by British labour, and all materials used in them are guaranteed by the suppliers to be British.

All these facts have been fully advertised since the motors in question were first marketed and can hardly be unknown to the electrical trade in general. In

fact, we have in the past received inquiries from the advertisers referred to for our repulsion induction motors, before they themselves began to manufacture machines of this type.

We should be indebted to you if you could see your way to publish this letter as a protest.

p.p. **The Normand Electrical Co., Ltd.,**
R. E. A. MALLET, *Director.*

London, S.W.4, *August 20th*, 1930.

[This letter has been slightly edited.—EDS. ELEC. REV.]

A Meter Problem.

With reference to J. W. Cooper's problem, I think that if he will examine the disk he will find a small piece of iron embedded in it.

A. E. Hawkeswood.

Manchester, *August 22nd*, 1930.

The Electric Organ.

Since the appearance of the article on electric organs in your issue of August 22nd, I have been given to understand that about 35 years ago Henley's made electro-magnets for Mr. Robert Hope-Jones, the "father" of the present-day instrument. I believe that the price was somewhere about tenpence each.

Electro-magnets manufactured by Henley's were used in the organ at Westminster Abbey.

Geo. B. Fuller.

London, E.C.1. *August 25th*, 1930.

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1928.

28,879. "Electric discharge devices." A. A. J. Crowne. July 4th, 1929. (332,734.)

1929.

2,486. "Manufacture and production of insulated cables." J. Y. Johnson (I. G. Farbenindustrie Akt. Ges.). January 24th, 1929. (332,891.)

2,919. "Detection and measurement of electric currents or voltages." V. H. Gilbert, A. H. Johnson, and Radiovisor Parent, Ltd. January 28th, 1929. (332,908.)

3,008. "Sound-recording apparatus." A. F. Sykes. January 29th, 1929. (332,909.)

6,366. "Cathodes for thermionic valves." Dr. B. Loewe. February 28th, 1928. (306,960.)

6,616. "Devices for the maintenance of telegraph, telephone, or signalling lines." G. Viard. October 18th, 1928. (Addition to 307,458.) (332,896.)

6,722. "Contact devices controllable by the movement of the film in kinematographic apparatus or in the reproduction of sound from films." British Thomson-Houston Co., Ltd. March 5th, 1928. (307,348.)

9,832. "Intercommunication telephone systems." Telefonaktiebolaget L. M. Ericsson. March 31st, 1928. (308,811.)

10,062. "Reversing arrangements for the electrical drive of metal and woodworking machines having a reciprocating movement of the work or of the tool." Akt. Ges. Brown, Boveri et Cie. March 31st, 1928. (308,833.)

10,084. "Electrical condensers." A. E White (Sprague Specialities Co.). March 28th, 1929. (Convention date not granted.) (332,899.)

12,869. "Variable-capacity electric condensers." Dubilier Condenser Co. (1925), Ltd. (W. Dubilier). April 25th, 1929. (332,941.)

13,104. "Apparatus for damping the oscillations of electric conductors." J. W. Hofmann (trading as J. W. Hofmann, a firm). April 27th, 1929. (332,900.)

13,227. "Automatic telephone systems." Siemens Bros. & Co., Ltd., D. A. Christian, and C. L. Peters. April 29th, 1929. (Cognate application, 285/30.) (332,904.)

13,254. "Electric motors." R. E. Smart and R. P. Myers. April 29th, 1929. (332,905.)

13,556. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., J. E. Osthne, R. Taylor, and C. E. Beale. May 1st, 1929. (Cognate applications, 26,913/29 and 30,177/29.) (332,956.)

14,491. "Apparatus for television and like purposes." F. W. Mather. May 9th, 1929. (332,971.)

14,611. "Oil-break switch." G. T. Fuery (Voigt & Haeffner Akt. Ges.). May 10th, 1929. (332,972.)

14,738. "Electric motor control gear." W. Asquith, Ltd., and W. Eastwood. May 11th, 1929. (332,974.)

14,887. "Electric rectifying installations." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). May 13th, 1929. (Cognate application, 20,193/29.) (332,976.)

14,888. "Devices for the irradiation of substances with ultra-violet rays." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). May 13th, 1929. (332,977.)

14,953. "Electrical immersion water heaters." H. A. Gill (R. F. McCartney). May 13th, 1929. (332,978.)

15,657. "Electric fuse boxes." V. Hope. May 21st, 1929. (332,985.)

15,753. "Driving arrangements for electrically-propelled vehicles." International General Electric Co., Inc. May 21st, 1928. (312,179.)

16,436. "Incandescent electric lamps." British Thomson-Houston Co., Ltd. May 28th, 1928. (312,613.)

16,990. "Electric sound boxes." P. G. A. H. Voigt. June 4th, 1928. (Cognate application, 1,863/30.) (332,996.)

17,096. "Telephone systems." Siemens Bros. & Co., Ltd. and D. A. Christian. June 4th, 1929. (332,999.)

17,303. "Electric heating units." Akt. Ges. Kummler & Matter. June 5th, 1928 (313,056.)

17,869. "Electrical oscillation circuits." Kolster-Brandes, Ltd. June 11th, 1928. (313,448.)

17,943. "Temperature-sensitive circuit closers for fire-alarm systems." G. H. Brady. June 11th, 1929. (333,003.)

19,235. "Electric circuit breakers." J. Anderson. June 22nd, 1929. (333,008.)

19,367. "Thermionic cathodes of vacuum electric tube devices." A. S. Cachemaille (Westinghouse Lamp Co.). June 24th, 1929. (333,011.)

19,416. "Electric power plants for running-in fluid-pressure engines." General Electric Co., Ltd., and W. Wilson. June 24th, 1929. (333,012.)

19,449. "U-tube thermometers adapted to close electric circuits when maximum and minimum temperatures are reached." H. S. Benson. June 25th, 1929. (333,014.)

19,529. "Method of, and means for, sectional electroplating, particularly applicable for plating large objects with chromium." Siemens and Halske Akt. Ges. June 26th, 1928. (314,392.)

20,584. "Telegraphic switchboard systems." C. Lorenz Akt. Ges. July 5th, 1928. (314,961.)

20,671. "Interrupter for adjusting or rectifying electric currents." M. Paul and P. Wangemann. July 5th, 1929. (333,022.)

21,082. "Means for generating high-frequency signalling energy." Wired Radio, Inc. July 31st, 1928. (316,576.)

23,613. "Operating means for electric condensers and other electrical instruments." C. F. Burton and H. Burton. August 1st, 1929. (333,049.)

23,651. "Electric induction motors." Sachsenwerk Licht-und Kraft Akt. Ges. September 27th, 1928. (319,730.)

28,687. "Braking apparatus for electrically-propelled motor vehicles." L. Spangler. September 27th, 1928. (319,739.)

32,140. "Electric apparatus for permanently waving the hair." E. E. Bonvalet. October 23rd, 1928. (333,107.)

33,826. "Light-sensitive devices." Westinghouse Electric and Manufacturing Co. November 6th, 1928. (333,116.)

34,560. "Device for altering the temperature error in induction electricity meters." Landis & Gyr Soc. Anon. January 9th, 1929. (333,123.)

36,832. "Electric water heaters." L. M. McLeod. December 2nd, 1929. (333,128.)

37,675. "Electric locomotives." Associated Electrical Industries, Ltd. December 7th, 1928. (333,132.)

38,815. "Thermionic apparatus." British Thomson-Houston Co., Ltd. December 27th, 1928. (333,136.)

1930.

6,385. "Electron-discharge amplifying apparatus." R. E. H. Carpenter. September 27th, 1929. (Divided application on 325,833.) (333,143.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 20th:—

Solvrite. No. 514,414. Class 13. Electrical fusible cut-outs made principally of ordinary metal.—C. W. COX, 15, Hargreaves Road, Sefton Park, Liverpool.

Durabit (lettering and design). No. 509,682. Same, but lettering only. No. 509,683. Class 50. Insulating tapes made of textile material impregnated with india-rubber.—Durabit Gummiwerke Gesellschaft, Vienna. (British representatives: Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.)

Taurite. No. 513,377. Class 50. Boxes, containers and cases, washers, bushes, plugs, &c., all made from electrical insulating compounds, and electrical insulating compositions composed principally of pitch or bitumen.—India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd., 106, Cannon Street, E.C.4.

Spectra of Gases under Strong Electrical Discharges.

The spectrum of a gas is known to vary with the pressure and the type of electrical excitation. Experiments, reported in *Science*, were undertaken to find out what the spectrum is like when very strong discharges are used. A small discharge tube containing the gas at pressures up to several cm. of mercury was arranged to be excited either in the usual way by the discharge of a transformer, or by a small 0.002 microfarad condenser, or by the violent discharges of a 1 microfarad condenser charged to 15,000 volts. The discharge of a 1 microfarad condenser at this voltage produced a blinding flash of light and a pulse of sound like a gunshot. With hydrogen in the tube the Balmer lines widened with increasing strength of the discharge, the higher members of the series disappeared and the continuous spectrum became more intense, until with the 1 microfarad condenser discharges there were no Balmer lines left at all, only the continuous spectrum and some absorption lines due to aluminium from the electrodes, &c. Helium, oxygen, and nitrogen exhibited similar changes, *i.e.*, with increasing intensity of the discharge in helium the lines gave way to a continuous spectrum, and in oxygen and nitrogen the molecular bands gave way to spark lines and these in turn to a continuous spectrum. The continuous spectra from all the gases were closely alike. The intensity distribution across the continuous spectrum was rather even and probably not that of a black body.

The result of the experiments was in some respects a surprise, although as the experiments progressed one could see in what direction they were tending. That certain lines would widen or disappear in the intense discharges was to be expected, but to find all the lines wiped out and their places taken by a smooth continuous spectrum was hardly anticipated. It seems that the external characteristics of the atoms were pretty well effaced, and it is suggested that the conditions approached those in the interior of a star.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ARUNDEL.—Cinema theatre; F. G. Mitchell, architect.

BALFRON.—Post office for H.M. Office of Works, King Charles Street, London, S.W.

BLYTH.—Houses (31); borough engineer.

BOGNOR REGIS.—Bank for National Provincial Bank, Ltd.

BOURNEMOUTH.—Baptist church, Winton, with electrical and heating work; Marshall & Bower, builders, Elmes Road.

BRECONSHIRE.—Small-pox hospital; County Council.

BREDON (Worcestershire).—Estate development; Croome estate trustees.

BRENTFORD.—Enlargement of Hogarth council school for the E.C.

BRISTOL.—School for the city E.C.; A. E. Oaten, architect, 22, Clare Street.

BULWELL (Nottingham).—R. C. church; Father Short.

CHESHIRE.—Two schools, Ellesmere Port and Whitby (960 places) for Cheshire E.C.; R. Potts, clerk, Chester.

CLACTON-ON-SEA.—Development of estate; Evans & Nunn, Ltd., London Road.

COVENTRY.—Elementary school, Moseley Avenue, for the E.C.

CROMER.—Hospital (£17,979); H. Bullen & Son, Ltd., builders.

CUMBERLAND.—Secondary school, Whitehaven, for the county E.C.; director of education, Carlisle.

DEVON.—Schools, Ashburton, Bampton, Braunton, Plympton St. Mary, St. Budeaux, and Yealmpton, for the county E.C.; B. S. Miller, clerk, Exeter.

DORSET.—School, Hampreston, for the E.C.; J. L. Torr, clerk, Dorchester.

DURHAM COUNTY.—School (520 places), Boldon Colliery, for Durham county E.C.; F. Willey, architect, 34, Old Elvet, Durham.

EDINBURGH.—Extension of George Dapin's Boys' College, Colinton Road; governors.

GLASGOW.—Reconstruction of Florida Cinema, King's Park; Hamilton Neil, architect. Maternity block, Stobhill hospital (£20,500); also motor-'bus garage, Anniesland, for the Corporation; city architect. Seven temporary schools (£25,700) for the E.C.

GRIMSBY.—Extensions, West Marsh Hospital, including nurses' hostel, operating theatre, laundry, &c.; secretary.

HARROW.—Presbyterian church, Kenton; trustees.

HATTON.—Nurses' home, Hatton mental hospital; Warwickshire county architect.

HULL.—Houses (37), Kirkella estate; J. Taylor. Estate development for Yorkshire Estates Co., near Holdnerness Road; Gelder & Kitchen, architects.

IRISH FREE STATE (Lismore, Co. Waterford).—Reconstruction of Courthouse, Lismore, for the C.C.; county surveyor, County Secretary's Office, Dungarvon.

LEICESTERSHIRE.—School, Shearsby, for the county E.C.; director of education, Leicester.

LONDON (Ilford, E.).—Congregational church, Woodford Avenue (£12,000); Rev. W. Rutherford Lane, pastor.

(Mile End, E.).—Reconstruction of La Bohême Cinema; Culpin & Bowers, architects.

(West Ham, E.).—Senior school (1,040 places) for the borough E.C.; J. Jacques, architect, 61, West Ham Lane, Stratford, E.

(Hornsey, N.).—Houses (70), Twyford Avenue; A. E. Bailey and Sons.

(Muswell Hill, N.).—Houses (60), Church Vale; E. N. Cansick.

(Camden Town, N.W.).—Rebuilding Royal Veterinary College; Forsyth & Maule, architects.

LONDON (*Continued*).

(Forest Hill, S.E.).—Development of Tewkesbury Lodge estate; H. Macintosh, architect, Croydon.

(Covent Garden, W.C.).—Development, Tavistock Hotel site, for Covent Garden Properties, Ltd.; Hood Bros., architects.

LULWORTH (Dorset).—Re-erection of Lulworth Castle, for Herbert Weld.

LONG EATON.—Houses (116); H. Raven, architect for U.D.C.

MACCLESFIELD.—Sewage disposal works for R.D.C.; J. H. Walters, engineer, Moody Street, Congleton.

MIDDLESBROUGH.—Conversion of Grand Opera House into cinema (£20,000); Gaumont British Corporation.

NEWPORT (I.O.W.).—Houses for Mount Joy Estate Co., Whitepit Lane; Stratton & Millgate, architects.

NORTHAMPTON.—Shops, offices and stores, 9-11, Bradshaw Street; A. R. & W. Cleaver.

NUNEATON.—Municipal buildings; borough engineer.

PAIGNTON.—Church, Cedar Road; Rev. T. W. Conran. Estate development, Dartmouth Road; J. Caunter. Town Hall; U.D.C. surveyor.

READING.—Extensions, Watlington House; Willcocks and Greenaway, architects, 11, Friar Street.

SALFORD.—Three-storey suite of offices for the Royal Liver Friendly Society, Liverpool; secretary.

SEAHAM HARBOUR.—Houses (224); U.D.C. surveyor.

SLEAFORD.—Extensions, Royal Air Force College, Cranwell, for H.M .Office of Works, King Charles Street, London, S.W.

SNAPETHORPE.—Sanatorium; Wakefield city engineer.

SOUTHEND-ON-SEA. — Extensions, General Hospital (£15,000); Adams, Holden & Pearson, architects, 9, Knightsbridge, London, S.W.

STAFFS.—School (400 places), Kingswinford, for the county E.C.; E. Joy, clerk, Stafford.

STRETFORD.—Works extension, Skerton Road; W. J. Brooks and Sons, Ltd. Extensions, Trafford Park Road; Royce, Ltd.

SUTTON.—Conservative club; Eiloart, Son & Inman, architects, 40, Chancery Lane, W.C. Houses (107), for Keasy and Broomfield. Houses (40) for Browett, Taylor and Co. Houses (37) for E. and H. Fletcher.

SWINDON.—Passenger transport offices for the T.C.; R. J. Beswick & Son, architects, 10, Victoria Road.

TARRING (Sussex).—Shops and houses, South Street; A. T. W. Goldsmith, architect.

TIPTON.—Wholesale clothing factory, Castle Mill Road; surveyor to U.D.C.

TONBRIDGE.—Alterations and additions to Poor Law Institution for Kent C.C. (£40,800); W. H. Robinson, county architect, Maidstone.

TYNEMOUTH.—Senior school, Linskill Terrace (£40,900), for the E.C.

WAKEFIELD.—Houses (200) Lupset estate; city engineer.

WANTAGE.—Houses (40) for the U.D.C.; George Green, surveyor.

WARWICKSHIRE.—Senior schools, Solihull, Southam, and Walsgrave, and new premises, Stratford-on-Avon High School; county architect.

WELWYN.—Municipal buildings, Bridge Street; U.D.C surveyor.

WEST SUSSEX.—Block for 115 patients, nurses' home, admission hospital, &c., Graylingwell, for the C.C. Mental Hospital Committee; Arthur Bloomfield & Driver, architects.